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IMPERIAL FOREST SCHOOL,

DEHRA DUN.

CALENDAR.

January 1, 1892.

Dehra Dun:

PRINTED AT THE TRIGONOMETRICAL BRANCH OFFICE, SURVEY OF INDIA.

B. V. HUGHES.

1892.

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STAFF OF THE IMPERIAL FOREST SCHOOL, DEHRA DÚN.

Board of Control.

The Inspector General of Forests with the Government of India (*President*);
The Director of Public Instruction, N.W. Provinces and Oudh;
The Director of the School;
Two Conservators of Forests (chosen yearly from different Provinces);
The Assistant Inspector General of Forests (*Secretary*).

DIRECTOR.

J. S. GAMBLE, M.A., Oxford; Fellow of the Madras University; F.L.S.; Conservator of Forests, School Circle, N.W.P. and Oudh.

DEPUTY DIRECTOR.

A. SMYTHIES, B.A., Cambridge; Deputy Conservator of Forests, N.W.P. and Oudh.

INSTRUCTORS.

UPPER CLASS.

Natural Science, Botany, &c.,	A. F. GRADON, Offg. Dy. Conservator of Forests, Burma.
Surveying, Forest Engineering, &c.,	C. G. ROGERS, Deputy Conservator of Forests, Bengal, L.P.

LOWER CLASS.

Babu UPENDRANATH KANJILAL, Forest Ranger, Assam.

Additional Instructors, not on the Permanent Staff.

Forest Law, ...	N. HEARLE, Dy. Conservator of Forests, Dehra Dún Division.
Mathematics, ...	A. P. GRENFELL, Assist. Conservator of Forests.
Zoology, ...	E. C. COTES, Assist Supt., Central Museum, Calcutta.
Systematic Botany,	G. A. GAMMIE, Offg. Director of the Botanical Department, North India, (for Mr. J. F. Duthie, B.A.)

Accounts and Procedure,	Babu KASHESHWAR MOOKERJEE, Head Clerk, School Circle.
Science and Botany (Lower Class),	,, BIRBAL, Forest Ranger.
Mathematics (Lower Class),	,, GOPAL SINGH.

Store-keeper and Museum-keeper,	Babu BIRBAL, Forest Ranger.
Head Clerk, . .	Pandit KIRPA RAM.
Hospital Assistant,	GUNGA SAHAI.

SCHOOL SITE AND BUILDINGS.

The Imperial Forest School, which was founded in 1878, is situated in Dehra Dún, in the North-Western Provinces. The School grounds lie to the south of the old Parade Ground and comprise the lands upon which the School buildings are erected, a vegetable and fruit garden and the Forest School Park or Arboretum.

The Buildings consist of:—

1. The main building containing—
   6 Lecture Rooms,
   Library,
   Museum Room,
   Herbarium,
   Offices of the Staff and those of the School Circle.
2. The Laboratory.
3. Quarters for 32 Students.
4. Carpenters' workshop and minor buildings.

The School was instituted for the instruction of the members of the Provincial staff of the Forest Department in India. Students are of three classes:—Government Students, Students from Native States, and Private Students.

RULES TO REGULATE APPOINTMENTS AND PROMOTIONS IN THE PROVINCIAL FOREST SERVICE.

I.—The Forest Service.

The Forest Service of India is composed as follows:—

(*a*) The Imperial Service.
(*b*) The Provincial Service.
(*c*) The Subordinate Service.

(*a*) The Imperial Service.

The Imperial Forest Service is recruited solely by officers directly appointed by the Secretary of State for India.

(*b*) The Provincial Service.

The Provincial Forest Service consists of:—

(*a*) Foresters who have obtained the Dehra Dún Forest School Certificate, Lower Standard.
(*b*) Forest Rangers.
(*c*) Extra-Assistant Conservators.
(*d*) Extra-Deputy Conservators.

(*c*) The Subordinate Service.

The Subordinate Forest Service, consisting of Foresters, Forest Guards, and other subordinate officials, is recruited from men appointed by Conservators or by Divisional Forest Officers under the sanction of section 40 of the Forest Code, and who do not pass through the Dehra Dún Forest School.

II.—The Provincial Forest Service.

The Provincial Forest Service can in future only be entered through the Dehra Dún Forest School.

III.—Admission Rules.

The rules for admission to the Forest School are as follows:—

1. There are two courses—one in English (the upper class), and a second in Hindustani (the lower class).

The former prepares students for the certificate in forestry by the higher standard; the latter for the certificate in forestry by the lower standard.

2. Application for admission to the School may be made in the first instance either to the Director, or to Conservators of Forests direct, or through Divisional Forest Officers. Candidates for admission must not be less than 18 nor more than 25 years of age: exceptions to this rule will require the previous sanction of the Government of India. Each candidate must furnish a certificate of sound health, and of good vision and hearing from the Civil Surgeon of the station nearest to his place of residence.

3. It is the duty of the Director or the Conservator who receives the application to satisfy himself that the candidate is of good moral character and active habits; also that he possesses fair powers of observation, sense of locality, and such other qualifications as are necessary for an officer of the Forest Department.

Admission to the English Course.

4. Candidates* who are accepted under Rules 2 and 3 for the English Course must, before admission to the School, pass an Entrance Examination in the following subjects, *viz*:—

English—composition and conversation.
Arithmetic.
Algebra—up to and including quadratic equations.
Elements of Euclid.
Mensuration—lengths, areas, and volumes.

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* Except those of Burmese, Shan, or Karen extraction, who, as a temporary measure during the years 1891 and 1892, will be admitted into the School after passing such Entrance Examination as a Conservator of Forests in Burma may deem sufficient.

5. This examination will be held before an officer of the School or before such officers of the Educational Department as the Local Governments may appoint for that purpose. The examination will be held either at the Forest School, or at such other convenient educational centres as the Local Governments may direct.

6. Conservators of Forests, including the Forest Officers of Coorg and Ajmere, are required to report to Local Governments by the 1st of January in each year the number of approved applicants, and submit proposals regarding the place or places at which the examination should be held.

The officers appointed by the Local Government to conduct the examinations should despatch to the Director on the 15th January in each year an application for the number of sets of examination papers to be sent to them. The examination papers will be forwarded from the Director's office, under sealed covers, not later than the 15th of the following month.

The examinations will be held simultaneosuly throughout India on three successive days about the 1st March, the precise dates being fixed by the Director at the time that the examination papers are sent out. Examinations held on dates other than those thus fixed by him will be treated as invalid. The candidates' written answers will, after countersignature (with date) by the officer presiding at the examination, be returned in a sealed cover to the Director of the School. The Director will subsequently inform Conservators of the result of the examination.

7. The Local Government may, under such rules as it may lay down, require that there be selected from the list of passed applicants such number as it may deem desirable to admit into the Provincial Forest Department at the end of the School course. Applicants so selected will have a preferential claim to be appointed to the Department.

8. Local Governments may grant to special candidates while pursuing their studies in the upper class at

the School, who are not already in receipt of any Government pay, an allowance not exceeding Rs. 50 a month under the conditions prescribed in Rule 13. Students will, on passing out of the School by the higher standard be eligible for appointment as Rangers under section 34 of the Forest Code, and can then be promoted to the class of Extra-Assistant Conservators under the special provisions of Rule 2 (*b*) in VI *infra*.

9. Local Governments may depute to the Forest School, in order to attend the English Course, officers who have served in the Subordinate Service for a period of not less than one full working season, provided that they have passed the examination prescribed in Rules 4 and 5. The age of all such officers shall be less than 25 years: an exception to this rule will require the previous sanction of the Government of India.

10. Local Governments may also depute Rangers to the School in order to qualify themselves for further promotion (*a*) in the class of Rangers, or (*b*) to that of Extra-Assistant Conservators. Such officials may be above 25 years of age, and need pass no qualifying examination, but will require to hold a certificate from the Conservator of Forests, under whom they are serving, that they possess sufficient general education and ability to enable them to profit by the English Course of instruction at the School.

Admission to the Hindustani Course.

11. Candidates for the Hindustani Course may be admitted as prescribed in the case of the English Course in Rules 2 and 3; but, in lieu of passing the Entrance Examination laid down in Rule 4, they must furnish a certificate of having passed the Middle Class Examination in the North-Western Provinces and Oudh, or an equivalent standard in another Province, as well as a certificate that they possess a competent knowledge of Urdu or Hindi.

12. Local Governments may depute to the Forest School, in order to attend the Hindustani Course, officers who have served in the Subordinate Service for a period of not less than one full working season, provided

that they have qualified as prescribed in the preceding rule for the admission of students of that class. The age of all such officers shall be less than 25 years: an exception to this rule will require the previous sanction of the Government of India.

13. Persons who may enter the Subordinate Forest Service with a view to being deputed for instruction to the Forest School at Dehra, as well as those who may be granted a Government stipend under Rule 8, shall be bound down by a formally executed Agreement—the sureties for the fulfilment of which should be men of some position and means—to continue in the Government Forest Service for a period of not less than five years after passing out of the Forest School, and on such rates of pay as may be in accordance with the existing organization of the Department. A breach of this condition, otherwise than with the consent of the Government of India, will render the offender and his sureties liable for the refund to Government of the entire cost of his education at the Forest School. The Agreement and Security Bond shall be in the appended forms (Appendix I), and must be executed before the student is admitted to the School. The Agreement will be signed by the student and, if he is a minor, by his father or guardian also; the Bond by the student and two sureties.

14. The obtaining of either of the certificates at the School will not, otherwise than as provided under Rule 7, be held to constitute a claim to Government service, although, when vacancies in the service occur, due consideration may be given to the fact that certificates have been obtained.

15. Students must supply their own note-books and stationery. Books from the book depôt will be supplied to them on cash payment only. Breakages and damages of School property must be paid for at once. As security for the due fulfilment of this condition, each student, not already in the service of Government, is required on entering the School to deposit a sum of Rs. 50 with the Director, the balance of which (if any) will be returned to him when he leaves. Students must, during their stay at the School, defray their own

expenses including the cost of travelling. Travelling allowances are granted to students already in the service of Government.

16. Candidates from Native States must apply, through the Darbar, either to the Director or to a Conservator of Forests. The conditions for their admission are similar to those laid down for other students. Native States sending students to the School shall, before the beginning of each term, deposit with the Director a sum equivalent to the estimated cost of the students' living at the School for the term as stated in Rule 5 under IV, *infra*, as well as the security deposit of Rs. 50 provided for in the preceding Rule. Remittances for students from Native States must be made by drafts payable to the students and forwarded to them through the Director.

17. Previous to receiving into the School any person who is not already in Government service, or in receipt of a stipend from Government or from a Native State, the Director shall satisfy himself that the candidate or his friends are able and willing to provide him with funds up to the amounts and at the times laid down in the estimate appended (Appendix II). A student who fails in this respect to satisfy the Director shall not be allowed to remain at the School.

IV.—General Rules.

1. Candidates admitted to the School must join at Dehra Dún on the 25th June next after the date of their passing the Entrance Examination.

2. The courses of training extend over 21 months, the time being spent as follows:—

1st year.

1st July—31st October . . .	At Dehra.
1st November—22nd December .	In camp.
23rd December—5th January .	Vacation.
6th January—31st May . . .	In camp.
June	Vacation.

2nd year.

1st July—31st October . .	At Dehra.
1st November—22nd December	In camp.
23rd December—5th January	Vacation.
6th January—14th March . .	In camp.
15th March—31st March . .	Final examinations.

3. At the close of the course of instruction, successful students will receive a Certificate in Forestry (Higher or Lower Standard) with or without honours.

4. Students who have completed their course leave the School at the end of March; but any student who has failed to obtain his certificate may, at the discretion of the Director and, in the case of students already in the service of, or in receipt of a stipend from, Government, with the sanction of the Local Government, or, in the case of students from Native States, of the Darbar, be retained to complete another full year's course of instruction. But during the course of instruction no examination for the final certificates will be held. Students who have failed to obtain the certificate by the Higher Standard by ten per cent or less of the necessary marks, may, at the discretion of the Director, be granted a Certificate in Forestry by the Lower Standard. Conservators of Forests—the students selected or deputed by whom are about to undergo their final examinations—are required to inform the Director, before the end of February in each year, as to the place to which each student on leaving the School is required to go, and as to the amount of the advance, if any, which may be given to enable him to reach it.

5. The average monthly cost of living at the School is calculated to be as follows, *viz.*:—

For students living in the Native style Rs. 22 to Rs. 28.
For students living in the European style ... Rs. 35.

The above figures include the cost of food, ordinary clothes, uniform, rent, books, and instruments. The expenses of travelling and camping during the entire

course of 21 months are calculated to come to something like an additional Rs. 130 for the former class, and about Rs. 210 for the latter class. The ordinary travelling allowances admissible to students already in the service of Government will cover these expenses.

6. All such students must, unless otherwise permitted by special order of the Director, live in the School quarters, if rooms therein are available. The rent charged is Rs. 2 per mensem for *each* student. Private students may be given quarters, when available, on the same terms.

7. During the course of instruction, the Director will furnish Conservators, or Darbars of Native States, with monthly reports on the character, application and progress of the students sent by them to the School.

8. Students are liable to the following punishments:—

(1) Reprimand by the Teacher in class.
(2) Reprimand by the Director or the Deputy Director at any time.
(3) Reprimand before a Meeting, convened by the Director, of not less than three School Officers, one of whom must be either the Director or the Deputy Director. The proceedings of the Meeting will be reported to the Conservator or the Native State deputing the student; and, if the Meeting so decides, a note of them will be made on his final Certificate.
(4) The Director, acting with the consensus of the Meeting referred to under (3), has power to inflict, in addition, a fine to the extent of one-third of the salary or allowances of the student for a period not exceeding three months.
(5) The Director, acting with the consensus of a full Meeting of the School Officers presided over by himself, has power to dismiss any student for misconduct; and a student thus dismissed cannot be re-admitted to the School.

The Director may remand any student who, in his opinion, is not sufficiently promising.

V.—Appointments to the class of Forest Rangers.

Appointments to the class of Forest Rangers may be given*—

(1) To passed students of the Dehra Dún Forest School—

(*a*) who have obtained the School Certificate in Forestry (Higher Standard) with or without honours;

(*b*) who have obtained the School Certificate in Forestry (Lower Standard) *with honours*, and who have afterwards rendered not less than *two* years' satisfactory service as Foresters;

(*c*) who have obtained the School Certificate in Forestry (Lower Standard) *without honours*, and who have afterwards rendered not less than *five* years' satisfactory service as Foresters.

All such appointments to fill existing vacancies may be made under the orders of the Conservator of Forests.

Candidates who are not natives of the province in which the appointment is to be made, or of a province in which one of the principal languages is the same, must furnish a certificate of having passed an examination by the lower standard in one of the principal languages of the province; or, in Burma, of having passed by the Elementary Standard in Burmese.

(2) Where there are no officers of the 1st class qualified for appointment, but not otherwise:—

(*a*) to subordinates who have earned such promotion by long, faithful, and meritorious service;

---

* The Chief Commissioner of Burma is authorised, as a temporary measure, to appoint as Rangers in Burma, in the absence of duly qualified candidates, persons who do not fulfil any of these conditions.

(*b*) to Native Non-Commissioned Officers of Her Majesty's Army who have entered the Forest Department under the orders contained in Circular No. 25–F., dated 12th November 1880.

Such appointments, to fill existing vacancies, may only be made under the orders of the Local Government.

VI.—Appointments to the class of Extra-Assistant Conservators.

Appointments to the class of Extra-Assistant Conservators (on salaries varying from Rs. 200 to Rs. 350) may be given:—

(1) To Forest Rangers—

(*a*) who have obtained at the Dehra Dún Forest School the Certificate in Forestry (Higher Standard), *with honours*, and who have afterwards rendered not less than *two* years' satisfactory service as Rangers in executive charge; or

(*b*) who have obtained this certificate *without honours*, and have afterwards rendered not less than *five* years' satisfactory service as Rangers in executive charge; or (in exceptional cases only)

(*c*) who were members of the Forest Department on the 1st December 1881, and who, though they have not obtained the Certificate in Forestry, (Higher Standard), have done specially good and faithful service, including a term of not less than *five* years as Forest Rangers, and who have received a good general education and possess a sufficient knowledge of English.

(2) Where there are no Rangers in the province

qualified for promotion under the above rules, but not otherwise—

(*a*) to candidates who, prior to the 1st July 1891, had been nominated by a Local Government under the rules embodied in section 36 of the Forest Department Code (3rd edition);

(*b*) to Rangers who, otherwise qualified, have not served the prescribed time.

In granting such appointments, students who obtain certificates *with honours* should be preferred to those who obtain certificates *without honours*.

Candidates nominated prior to the 1st July 1891 will continue to draw the allowances granted to them under section 39 of the Forest Department Code (3rd edition).

VII.—Appointments to the class of Extra-Deputy Conservators.

Appointments to the class of Extra-Deputy Conservators (on salaries varying from Rs. 450 to Rs. 600) will be made by the promotion of officers of the Lower Controlling Staff who hold the Higher Standard Certificate in Forestry of the Dehra Dún Forest School, and who have done good service of not less than five years as Extra-Assistant Conservators in either of the two upper grades (Rs. 350 and Rs. 300) of the latter class.

VIII.—Provincial Forest Service.

The Provincial Forest Service will be allotted to the same six Provincial Lists on which the Imperial Branch of the Upper Controlling Staff is borne, and the members of the Provincial Service will be shown on those lists according to seniority in service. Promotions will be made on each Provincial List as a whole, and not in respect of local Circles.

IX.—Promotions in the Provincial Forest Service.

Promotions in the Provincial Forest Service will be regulated as follows:—

Foresters to the class of Rangers if they have qualified under V (1).	By the Conservator.
Foresters to the class of Rangers if they are considered qualified under V (2).	By the Local Government.
Rangers from grade to grade.	
Rangers to the class of Extra-Assistant Conservators.	
Extra-Assistant Conservators from grade to grade.	
Extra-Assistant Conservators to the class of Extra-Deputy Conservators.	
Extra-Deputy Conservators from grade to grade.	

APPENDIX I.

Forms of Agreement and Bond to be executed by students already in the service of, or in receipt of stipends from, Government, previous to entry into the Forest School, Dehra Dún.

Articles of Agreement made and entered into this day of
18 BETWEEN
of
of the first part
of
son of the said of the second part and the SECRETARY OF STATE FOR INDIA IN COUNCIL hereinafter referred to as the Secretary of State of the third part. Whereby each of the parties hereto so far as the covenants and conditions on his own part are to be observed and performed covenants with the other of them as follows:—

1. The said hereby of his own free will and consent and with the approbation and consent of the said testified by the execution by him of these presents agrees with and to the Secretary of State his successors in office and assigns that he the said shall well and faithfully pursue his studies at the Government Forest School, Dehra Dún, and qualify for the Forest Service of the Government of British India or of any Local Government.

2. The said shall after completing his studies at the said Forest School and if so required to do serve the Secretary of State his successors in office and assigns in the Forest Department of the Government of British India or of any Local Government for a period of not less than five years and shall during the whole of such period diligently and efficiently do all acts and discharge all duties which may be

required to be done by him in his capacity as an officer of the said Department.

3. The Secretary of State his successors in office and assigns hereby engages to educate the said at the Dehra Dún Forest School in all matters relating to forest service forest works and forest administration that it may be deemed necessary by the Director of the said School to teach the said

4. The Secretary of State shall pay the said during the whole period of his stay at the said School at and after the rate of Rs. per month and thereafter while the said shall faithfully and diligently serve as an officer of the said Forest Department at and after the rate of not less than Rs. per month and the said shall be entitled to all the rights and privileges in respect of pay pension and promotion accorded to officers of the said Department for the time by the Rules and Regulations of the Department.

5. Lastly it is hereby agreed and declared that the Secretary of State his successors in office or assigns shall be at liberty to rescind this agreement on account of the negligence failure to attend to duty idleness or any insubordination or misconduct on the part of the said and to dismiss him from the said Forest School or the service of the said Department and the said shall not be entitled to any of the privileges hereby imposed on him but the said or shall thereupon refund to the Secretary of State his successors in office and assigns the total cost including the monthly payments made to the said while at the said School incurred by the Secretary of State or his successors in office or assigns in respect of the education of the said at the said School.

IN WITNESS whereof the said parties to these presents have hereunto set their respective hands and seals the day and year first above written.

Know all men by these presents that we
of
principal (obligor)
of
and of
(sureties) are jointly and severally bound to the SECRETARY OF STATE FOR INDIA IN COUNCIL in the sum of Rs.
to be paid to the said Secretary of State his successors in office or assigns or his or their certain attorney or attorneys for which payment well and truly to be made we bind ourselves our heirs executors administrators and representatives and each of us binds himself his heirs executors administrators and representatives firmly by these presents sealed with our seals and dated this day of 18

WHEREAS the Secretary of State for India in Council for himself and his successors in office and assigns has engaged to educate the said at the *Dehra Dún* Forest School in all matters relating to forest science forest works and forest administration that it may be deemed necessary by the Director of the said School to teach the said
and has also agreed to pay him during the whole period of his stay at the said School at and after the rate of
rupees per month and whereas the cost per annum of such education without any such allowance being included is estimated to be Rs. which shall be taken to be the actual cost for the purpose of these presents and whereas in consideration of such education and pay to be given to the said
as aforesaid by the said Secretary of State and his successors in office and assigns the said
has agreed with the said Secretary of State his successors in office and assigns that he will after completing his studies at the said School and if required to do so serve in the Forest Department of the Government of British India for a period of not less than five years during the whole of which time he will diligently and efficiently do all acts and discharge all duties which may be required of him to be done in his capacity as an officer of the said Department. AND WHEREAS the said Secretary of State has also on his part agreed that the said shall be paid for such

service at and after the rate of not less than
rupees per month and shall be entitled to all the rights and privileges in respect of pay pension and promotion accorded to officers of the said Department for the time being by the Rules and Regulations of the Department. AND WHEREAS for the purpose of securing and indemnifying the said Secretary of State his successors in office and assigns against all loss and damage which he or they might or may in any way suffer by reason of the said leaving without permission the service of the said Secretary of State his successors in office or assigns in less than five years after the completion of his studies at the said School and for the purpose also of securing the refund to the said Secretary of State his successors in office and assigns of the total cost including the monthly payments made to the said while at the said School incurred by the said Secretary of State or his successors in office or assigns in respect of the education of the said at the said School and in consideration of the payment and education so as aforesaid to be made and given to the said at the said School and as one of the conditions of the admission of the said
to the said School it has also been agreed that the said and the said and as his sureties should execute the above-written Bond subject to the condition hereinafter contained. Now the condition of the above-written Bond or obligation is such that if the said shall well and faithfully and diligently pursue his studies at the said School and qualify for the said forest service and shall also after completing his studies at the said Forest School and if so required to do serve the said Secretary of State his successors in office and assigns in the Forest Department of the Government of British India or of any Local Government for a period of not less than five years and shall during the whole of such period diligently and efficiently do all acts and discharge all duties which may be required to be done by him in his capacity as an officer of the said Department and if the said and or either of them their or either of their heirs executors

administrators and representatives shall well and truly indemnify the said Secretary of State his successors in office and assigns against all loss and damage which he or they might or may in any way suffer by reason of the said giving cause for dismissal either while at the said School or while in the service of Government thereafter or of his leaving the service of the said Secretary of State his successors in office or assigns without permission in less than five years after the completion of the studies of the said at the said School and and if the said and or either of them their or either of their heirs executors administrators or representatives shall also pay to the said Secretary of State his successors in office or assigns all sum or sums in any way expended paid or incurred by the said Secretary of State his successors in office or assigns in respect of the education of the said at the said School then the above-written Bond or obligation shall be void otherwise the same shall remain in full force and virtue. PROVIDED ALWAYS and it is hereby expressly agreed and declared that these presents shall be treated and considered as entered into under the orders of the Government of India for the performance by the said and and of a public duty and an act in which the public are interested within the meaning of section 74 of Act IX of 1872 of the Legislative Council of India.

IN WITNESS, &c.

APPENDIX II.

Estimated probable minimum Expenditure which will be incurred by Students under instruction at the Forest School.

Items for which and time at which allowances are required.	For Students living in the Native Style.		For Students living in the European Style.
	Lower Class.	Upper Class.	Upper Class.
	Rs.	Rs.	Rs.
(i) Monthly subsistence allowance necessary to defray cost of food, clothes, rent, and sundries.	20	24	30
(ii) Allowance required for first cost of uniform and equipment, when the student first joins the School.	20	20	50
(iii) Cost of books and instruments, payable when the student first joins the School, or in two instalments, as the Director may decide.	25	60	60
(iv) Allowance necessary to meet expenses as regards outfit, *i.e.*, on first starting into camp about the end of October in the first year.	40	40	60
(v) Monthly allowance required to meet travelling expenses for seven months (November to May) in the first year, and five months (November to March) in the second year.	4	4	8
(vi) Additional allowance necessary to meet expenses of the Hill Tour in the middle of April in the first year.	9	12	20
(vii) Additional allowance required to meet the cost of the Punjab Tour in January of the second year.	30	35	35
(viii) Total of (ii) to (vii) for 21 months of Course.	172	215	321
(ix) Average per mensem of (ii) to (vii) ...	8	10	15
(x) Total monthly average [(i) plus (ix)]	28	34	45
(xi) Monthly average, exclusive of travelling expenses [(iv) to (vii)].	22	28	35

SYLLABUSES OF THE SUBJECTS TAUGHT.

FORESTRY.

English Course.

SYLVICULTURE.

I.—The Composition of Forests.

1. *Trees.*—Definitions; their mode of growth and reproduction; requirements with regard to light, moisture, &c.; classification of trees; gregarious and non-gregarious species; indigenous and exotic species.

2. *Principal characters or requirements of trees,* illustrated by references to the more important forest species in India as regards—

Habitat;
Temperament;
Root system and aptitude to produce stool-shoots and suckers;
Fructification;
Usual dimensions, longevity, &c.;
Purposes for which used—
(1) wood, (2) accessory products.

3. *Crops.*—Their characters; spontaneous and artificial crops; pure and mixed crops; types of the more important Forest crops in India.

4. *The struggle for existence*—Amongst individual trees in a forest crop; principal factors which influence

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Note.—This course extends over the whole of 21 months of instruction as follows:—

July 1 to October 31.—Rains term, 1st year. Sylviculture IV.

November 1 to March 31.—Winter term, 1st year. Sylviculture I. II. III.

April 1 to May 31.—Hill tour, 1st year. Utilization and practical sylviculture.

July 1 to October 31.—Rains term, 2nd year. Utilization and working-plans.

November 1 to March 15.—Winter term, 2nd year. Revision of whole subject.

this struggle under various circumstances; illustrations and examples in India.

5. *Pure and mixed crops.*—Relative advantages and disadvantages of each class under various circumstances. Rules for growing pure and mixed crops. Illustrations drawn from Indian forests.

II.—Methods of treating and exploiting forests.

1. *Definitions of general principles.*—Organized and unmethodical exploitations; rules regarding the allocation of the fellings.

2. *The principal methods of treating or exploiting forests explained, with special reference to improvement fellings and regulation of the future stock, viz.:—*

High forest treated by the selection method.
Ditto clearance method; natural regeneration and artificial regeneration.
High forest treated by the uniform and group methods.
Simple coppice.
Coppice with standards.
Provisional methods of treatment, conversions, transformations, and restorations.

3. *Detailed examination of each of these methods of treatment.* Nature of crops and conditions under which each is especially suitable; manner of applying the method in each case; cultural operations required in connection with each.

4. *Example of the application of each of these methods to some of the more important or abundant Indian forest crops.*

III.—The Maintenance and Improvement of Forests.

1. *Attention to be given to the soil in sylviculture.*

2. *Fostering operations in young crops:—*

Cleanings.
Thinnings.
Prunings.

3. *Other operations made with a view to the improvement of the crop, viz..—*

Climber cutting, irrigation, and drainage works.

4. *Summary remarks regarding the causes of injury and the necessity and practicability of combating them—*
Fire-conservancy.
Grazing.
Rights and privileges in forests.

IV.—Artificial creation and restocking of forests.

1. *Methods by which trees may be reproduced artificially.*
2. *Collection, treatment, and storage of seed.*
3. *Direct sowings.*
4. *Whole area sowings*—(with cultivation; without cultivation).
5. *Partial sowings*—in strips; in patches and plots; in trenches and furrows; on ridges, in holes and hollows: cases in which each of these methods may be best employed.
6. *Obstacles to direct sowing.*—Obstacles commonly met with and means of overcoming them.
7. *Planting.*—Cases in which necessary: why generally preferable to direct sowings.
8. *Nursery management.*—Laying out the nursery; permanent and temporary nurseries; size of nursery; soil; manures; seed-beds; sowing the beds; season for sowing; treatment of the seed-beds after sowing; weeding and irrigation; transplanting in the nursery lines when necessary; precautions.
9. *Planting out.*—Properties of good transplants; manner of conducting operations; packing and transport of the planting material.
10. *Different methods of planting out.*—In pots or baskets; in holes, notches, and hollows; in trenches; on mounds and ridges; on platforms and trees: cases in which each of these methods may be successfully employed.
11. *Obstacles to planting frequently met with and methods of overcoming them.*—The artificial restocking of swampy or water-logged land, drifting sands and unstable slopes, barren soils, areas where rainfall is insufficient, &c.
12. *Relative advantages and disadvantages of direct sowing and planting compared.*

13. *Maintenance operations in a young plantation.*—Freeing the heads of young plants, cleaning, thinning, fencing, &c.

UTILIZATION.

I.—Working agency and organisation of labour.

II.—Utilization of wood.

1. The technical properties of woods.
2. Classification of wood for purposes of sale.
3. The different wood-using industries and the quality and condition of the wood they respectively require.
4. Tools, &c., used for felling and conversion.
5. Felling.
6. Conversion, seasoning and storage of wood.
7. Disposal and sale of wood.

III.—Utilization of minor produce.

1. Leaves, including grazing and fodder, and litter and manure.
2. Flowers and fruit.
3. Bark.
4. Minor produce obtained from wood, including dyes, tans, and other extracts, oil, acids, wood spirit, tar, &c.
5. Roots.
6. Exuded products, including sugary sap, gums, resins, varnishes, caoutchouc, &c.
7. Animal products, including lac, silk, honey, wax, hides, horns, also the regulation of hunting, shooting, and fishing.
8. Mineral products.

IV.—The principal minor forest industries.

1. Charcoal-making.
2. Manufacture of cutch and katha.
3. Distillation of sandalwood oil.
4. Preparation of resin and turpentine products.
5. Impregnation of timber.

WORKING-PLANS.

I.—General Principles and Definitions.

1. *Forest organization,* in what it consists; meaning of the term "Working-plan," its purpose and reason why required; constitution of the growing stock in organized forests.

2. *Meaning of terms employed in Working-Plans*—exploitability, exploitable age, felling or girdling rotation, possibility, permanent and provisional plans, provisional period, revenue, working-circle, block, compartment, method of treatment, permanent and provisional treatment, classes of fellings, regeneration fellings, improvement fellings.

II.—Field work required in connection with the preparation of a Working-Plan.

1. *Preliminary reconnaissance of the area;* information required with regard to it.

2. *Selection of methods of treatment to be applied and formation of working-circles.*

3. *Analysis of crop;* subdivision of area into blocks and compartments, and reasons for this subdivision; selection of the compartments, their size and boundaries.

4. *Description of the compartments;* degree of detail required; information to be recorded with regard to the (*a*) situation, (*b*) the soil, (*c*) the standing stock.

5. *Manner in which the description is drawn up;* graphic method of recording the nature of the crop; stock maps.

6. *Determination of the number of trees in a crop;* different methods employed to determine the number of trees; choice of a method; selection of plots in the method by sample plots; size classes of trees; manner of enumerating the trees; recording the results of the enumeration.

7. *Calculation of the volume of material in a crop;* cases in which used; methods of making the calculation; method by type trees; measurement of standing trees; measurement of felled trees; measurement of stacked timber.

8. *Determination of the exploitable age of trees;* method by readings on stumps; method by measurement with Presslers' gauge recording the results of the readings.

III.—The preparation of Working-Plans.

1. Working-Plan for a simple coppice.
2. „ coppice with standards.
3. „ seedling forest by the selection method.
4. Working-Plan for a seedling forest by the methods of clearances and strip method.
5. Working-Plan for a seedling forest by the uniform method of successive fellings and thinnings.
6. Working-Plan having in view the regulation of the future stock.
7. Working-Plan for (Uebergangs period) transformation period.

IV.—The Working-Plan Report.

1. Order and arrangement of the subjects to be treated in a Working-Plan Report.
2. Code prescriptions regarding the preparation of Working-Plans and for securing adherence to them.

MATHEMATICS.

(With its Forest Application.)

English Course.

I.—Algebra.

1. *Proportion*—Comparing rates for material and work in different districts.
2. *Arithmetical Progression* } Application to calculation of increase of volume of growing stock or individual trees, &c.
3. *Geometrical* „ }

4. *Interest, simple and compound.*
5. *Discount.*
6. *Present value.*
7. *Annuities.*

} Applied to estimating the value of forests as they stand and value after a period of years; advantages accruing from capital expenditure on works improvement, or having for their object the cheapening of export or conversion charges.

8. *Logarithms*—to simplify calculations.

II.—Trigonometry.

1. English and French methods of subdividing angles.
2. Trigonometrical ratios.
3. Ditto. of angles of 30°, 45°, 60°, 90°.
4. Expression of half angle in terms of whole angle.
5. Expansion of trigonometrical functions of $(A \pm B)$.
6. Trigonometrical equations.
7. Logarithms and logarithm tables.
8. Heights and distances, with special reference to problems occurring in forestry and surveying.
9. Solution of triangles with and without the use of logarithms.

III.—Mensuration.

1. Applied to standing trees.
2. „ fallen trees.
3. „ timber in log.
4. „ converted timber.
5. „ firewood in stacks, &c.
6. „ charcoal.
7. „ earthwork.

IV.—Statics.

1. Definitions and preliminary ideas.
2. Pressure, tension, and weight.
3. Parallelogram of forces.
4. The triangle of forces.

5. Composition and resolution of forces acting at a point.
6. Resultant of parallel forces, the couple.
7. Moments.
8. The lever.
9. The balance and steelyard.
10. Pulleys.
11. Wheel and axle, toothed wheel.
12. The inclined plane with and without friction.
13. The wedge.
14. Work.

V.—Dynamics.

1. Comparison of rates of velocity.
2. First law of motion.
3. Gravity and falling bodies.
4. Bodies moving from rest with or without initial velocity.

VI.—Hydrostatics.

1. Syphon.
2. Air-pump, force-pump, common pump.
3. Hydrostatic presses.

PHYSICAL SCIENCE.

English Course.

I.—Chemistry.

1. Preliminary notions; nomenclature; symbols; formulæ; equations.
2. Elements; non-metals, metals.
3. Oxygen, its properties; its preparation; its occurrence in nature.
4. Hydrogen, its properties; its preparation; its occurrence in water.
5. Nitrogen, its properties; its preparation; its occurrence in air.
6. Oxides, bases, acids, alkalis, salts.
7. Ammonia, nitric acid, occurrence in nature.

8. Chlorine, bromine and iodine; hydrochloric acid.

9. Carbon and its different forms; combustion and the structure of flames; carbo-hydrates.

10. The oxides of carbon; their properties, their preparation, their occurrence in nature.

11. Sulphur; its properties, preparation and occurrence in nature; oxides of sulphur.

12. Phosphorus; its properties, preparation and occurrence in nature; phosphates.

13. Silica; its properties and occurrence in nature.

14. Metallic elements; groups; potassium, sodium, calcium, aluminium, magnesium, iron, copper.

II.—Physics.

1. Definition, branches, preliminary ideas.

2. Matter, its forms; mass, volume, weight.

3. Solids, liquids and gases; comparative properties; pressure; specific gravity.

4. Capillary phenomena; endosmose and exosmose.

5. Pressure of the atmosphere; the barometer; air-pump, common pump, force-pump, syphon.

6. Heat; expansion; the thermometer; fusion, sublimation, evaporation, ebullition, steam; distillation; conduction, convection, and radiation.

7. Light; reflection, refraction, telescope, microscope.

8. Magnetism; the magnetic needle and its applications.

III.—Physiography.

1. The earth and its position in the solar system; the sun, the moon; motions of the earth; day and night; the seasons.

2. The atmosphere, its density, depth and composition; dew and hoar-frost, fog, cloud, rain, hail, snow. The winds, their causes; the monsoons; trade winds; land and sea breezes.

3. The ocean; its distribution; depth; composition; currents; tides.

4. Rivers; catchment basins; watersheds and water partings; springs; mountain torrents; deltas; lakes, their movement.

5. Ice and snow; glaciers; moraines; icebergs.

6. Mountain chains; their character and distribution, cause of upheaval, valleys.

7. Denudation; action of the sea, of rivers and ice; action of the atmosphere; decomposition and disintegration of rock; formation of soil.

8. Internal heat of the earth; earthquakes, volcanoes, hot springs.

9. The land and its tenants. Distribution of land and water, general structure of the existing continents. Asia, its position and character. India, its rivers, mountains, plains, rainfall, seasons, winds.

10. Flora and Fauna; their relation to the temperature and rainfall. Zones of vegetation, especially tree.

IV.—Geology and Mineralogy.

1. Sedimentary rocks; their origin, varieties and composition; sandstone; conglomerates; shales.

2. Organic rocks; their origin, composition and characteristics; chalk; limestone; peat; coal.

3. Igneous rocks; their composition and origin; lava; trap, basalt, granite.

4. Metamorphic rocks; gneiss, mica, schist, marble, slate, quartzite.

5. Stratification; its cause; dip and strike; horizontal strata and inclined strata; faults.

6. Chronological orders of stratified rocks, characteristics of the great formation; organic remains (fossils) found in them.

7. Short account of Indian geology; characteristics of Peninsular and extra-Peninsular areas.

8. Chief physical properties of minerals; chemical composition and common tests.

9. Chief minerals of India; quartz, mica, felspar and kaolin; ores of iron, laterite, kunkur; lime-stone, 'tufa,' &c.

V.—Soils.

1. Modes of formation.

2. Organic and inorganic constituents; soluble and insoluble ingredients.

3. Classification of soils; sand, clay, loam, humus.

4. Subsoil; surface soil; influence of organic life; influence of vegetation; influence of the circulation of water; influence of temperature.

5. Physical properties of soil; chemical properties; presence of gases.

6. The simple analysis of soils.

7. The improvement of soils; chief organic and inorganic manures and their effects.

BOTANY.

English and Vernacular Courses.

I.—Morphology.

1. The nature of plants as distinguished from animals.

2. Classification of plants.
   (*a*) Phanerogamous plants.
   (*b*) Cryptogamous plants.

3. Phanerogamous plants—their organs.
   (*a*) Organs of vegetation: root, stem, leaves.
   (*b*) Organs of production: flower, fruit, seed.

4. The *root*: fibrous, tuberous, taproots.
   Underground stems or rhizomes: tubers, bulbs, corms.

5. The *stem*: erect, prostrate, creeping, climbing, cæspitose, culms.
   Branches: their arrangements and sub-divisions.

6. The *leaves*: petiole, blade, stipules.
   Simple and compound leaves, entire or lobed leaves, opposite and alternate leaves, the various shapes of leaves.

7. The *inflorescence*: terminal or auxiliary, centrifugal or centripetal: spike, raceme, panicle, head, umbel, cyme, corymb, thyrsus, catkin, spadix, spikelet.
   Bracts, involucre, spathe, glumes.

8. The *flower*: perfect and imperfect; monœcious, diœcious or polygamous; dichlamydeous, monochlamydeous.
   Parts of the flower: calyx, corolla, stamens, pistil.

9. The *corolla*: gamopetalous, polypetalous, regular or irregular.
   Its shape, æstivation, and colour.

10. The *stamens*: filament, anther, pollen.
    Arrangement of stamens: monadelphous, diadelphous, &c., didynamous, syngenesious, gynandrous, &c.
11. The *pistil*: ovary, ovule, style, stigma.
    Ovary: syncarpous, apocarpous; placentation, axile and parietal. Ovule: straight, incurved, inverted.
12. The *fruit*: simple and compound; dry and succulent; dehiscent and indehiscent.
    Kinds of fruit: berry, drupe, capsule, pod, nut, samara, follicle, siliqua, pome, pepo, cone, caryopsis.
13. The *seed*: testa, tegmen, embryo, albumen, funicle, aril, hilum, micropyle; the embryo: radicle and plumule, cotyledons.
14. *Accessory organs*:—Thorns, prickles, tendrils, hairs, glands.

II.—Anatomy.

1. The *cell*: nature of the cell, cell-wall, protoplasm, formation of new cells, substances contained in protoplasm, cell sap.
2. *Tissue*:—
   (*a*) Cellular tissue—
      (1) Epidermis: epidermal cells, stomata, hair structures.
      (2) Cork.
      (3) Parenchyma.
   (*b*) Sclerenchyma: short elements, long elements or fibres.
   (*c*) Secretory reservoirs: sacs containing crystals, sacs containing mucilage, sacs containing resins and gum resins, tannin sacs.
   (*d*) Tracheæ:—
      (1) vessels;
      (2) tracheides.
   (*e*) Sieve-tubes.
   (*f*) Laticiferous ducts: latex.
   (*g*) Intercellular spaces: intercellular secretory reservoirs; intercellular spaces containing air and water.

3. Structure of the root—
   (*a*) primary or tap root;
   (*b*) secondary or lateral roots and rootlets;
   (*c*) secondary thickening;
   (*d*) root hairs.
4. Structure of the stem—
   (*a*) Angiosperms:
      (1) herbaceous type, young, mature.
      (2) woody type immediately after germination; after formation of primary bundles, when secondary growth in thickness has begun.
   (*b*) Gymnosperms (similar divisions).
   (*c*) Monocotyledons—
      (1) herbaceous type;
      (2) arboreous type; no secondary thickening: palms, bamboos; with secondary thickening: Liliaceæ.
5. Structure of the leaf—
   (*a*) Angiosperms—
      (1) petiole;
      (2) blade: bifacial type, centric type.
   (*b*) Gymnosperms.
   (*c*) Monocotyledons.
6. Structure of the reproductive organs: structure of the pollen grain; structure of the embryo; fertilization.
7. *Fungi*.—Structure, reproduction.

III.—Physiology.

1. *The external conditions of plant life*: temperature, light, gravitation, periodicity of temperature and light.
2. *The internal conditions of plant life*: diosmose; turgescence; tissue—tensions.
3. *Nutrition*—
   (*a*) Absorption of moisture and nutritive matter in solution by the roots; nutritive materials so obtained.
   (*b*) Transpiration.
   (*c*) Assimilation; taking up and fixing of carbon by the leaves; other bodies absorbed by the leaves.

(*d*) Metabolism; change of nutritive materials, *e.g.*, starch into other nutritive substances; reserve materials; ferments; dormant periods.
(*e*) Passage of the elaborated materials through the tissues.
(*f*) Respiration.
(*g*) Ascent of water.

4. *Growth*—
(*a*) The three phases of growth: embryonic growth, elongation, completion of internal differentiation.
(*b*) Formation of organs at the growing point: development of leaves, buds, and branches, internodes.
(*c*) Correlations of the different organs: influence of growing shoots on other shoots; organs of like kinds complete for the same constructive materials, hence scale leaves and dormant buds; influence of root activity on the functions of leaves.
(*d*) Nutations and torsions due to unequal growth.

IV.—Wounds and Diseases.

1. Healing up of wounds—
(*a*) in herbaceous parts; bark abrasures;
(*b*) in woody parts; cuts extending to the wood.
2. Parasites; their action—
(*a*) flowering parasites—
(1) root parasites: Orobanche, &c.;
(2) stem and branch parasites: Loranthus, &c.
(*b*) Fungi:—
(1) parasitic: those entering by the roots; those which enter by wounds; those which attack the leaves.
(2) saprophytic.
3. Injuries caused by atmospheric phenomena:—
(*a*) temperature: frost, excessive heat, alternations of heat and cold.
(*b*) winds: hot winds, storms.
4. Injuries by fire.

V.—Classification.

1. Classification of plants: classes, orders, genera, species, varieties, individuals.

2. Divisions of phanerogams: Dicotyledons and Monocotyledons, characters of the two groups in seed, leaf, stem, &c.

3. Divisions of Dicotyledons—

Angiosperms, with seed enclosed in a pericarp;

Gymnosperms, with naked seeds.

4. Angiospermous plants—

(*a*) Polypetalæ, sub-divided into Thalamifloræ and Calycifloræ.

(*b*) Gamopetalæ.

(*c*) Apetalæ.

(Characters of each.)

5. Thalamiflorous orders, especially those of forest consequence. Some of the following:—

(*a*) Dilleniaceæ;	(*h*) Sterculiaceæ;
(*b*) Magnoliaceæ;	(*i*) Tiliaceæ;
(*c*) Anonaceæ;	(*j*) Rutaceæ;
(*d*) Guttiferæ;	(*k*) Burseraceæ;
(*e*) Ternströmiaceæ;	(*l*) Meliaceæ;
(*f*) Dipterocarpeæ;	(*m*) Sapindaceæ;
(*g*) Malvaceæ;	(*n*) Anacardiaceæ;

Give an analysis, enabling each to be determined.

6. Calyciflorous orders, especially those of forest consequence. Some of the following:—

(*a*) Leguminosæ;	(*e*) Myrtaceæ;
(*b*) Rosaceæ;	(*f*) Lythrarieæ;
(*c*) Rhizophoreæ;	(*g*) Samydaceæ;
(*d*) Combretaceæ;	(*h*) Cornaceæ;

Give an analysis, enabling each to be determined.

7. Gamopetalous orders, especially those of forest consequence:—

(*a*) Rubiaceæ;	(*g*) Loganiaceæ;
(*b*) Ericaceæ;	(*h*) Borragineæ;
(*c*) Sapotaceæ;	(*i*) Bignoniaceæ;
(*d*) Ebenaceæ;	(*j*) Acanthaceæ;
(*e*) Oleaceæ;	(*k*) Verbenaceæ;
(*f*) Apocyneæ;	(*l*) Labiatæ;

Give an analysis, enabling each to be determined.

8. Apetalous orders, of forest consequence. Some of the following:—

(*a*) Santalaceæ;
(*b*) Lauraceæ;
(*c*) Urticaceæ;
(*d*) Euphorbiaceæ;
(*e*) Cupuliferæ;
(*f*) Juglandeæ;
(*g*) Salicineæ;

with analysis.

9. Gymnosperms; the two chief orders of which are:—

(*a*) Coniferæ.
(*b*) Cycadaceæ.

10. Monocotyledons. The following being those of chief importance:—

(*a*) Palmæ.
(*b*) Liliaceæ.
(*c*) Gramineæ.

11. Cryptogameæ—Plants with no stamens or ovaries, spores of single cells:—

Group I—Vascular cryptogams.
„ II—Muscineæ.
„ III—Thallophytes.

12. Vascular cryptogams, chief family of forest interest.

(*a*) Filices.

13. *Muscineæ.*—Mosses in respect to their influence on the soil, on tree trunks, &c.

14. *Thallophytes.*—Algæ and Fungi, separated by presence and absence of Chlorophyll; former of but slight forest interest; latter often of great importance.

15 *Fungi.*—As causes of decomposition and disease. Very short account of the chief families of forest interest:—

(*a*) Schizomycetes, causes of disease.
(*b*) Saccharomycetes, ferments.
(*c*) Peronosporeæ, leaf diseases.
(*d*) Uredineæ, rusts, Æcidia, &c.
(*e*) Hymenomycetes, chief species as Agaricus, Polyporus, Trametes, Merulius, destructive to trees and timber.

16. The collection and preparation of specimens.

VI.—Geography.

1. General distribution of forests and cultivated plants.
2. Chief trees of India, their distribution.
3. Chief regions or zones of vegetation, and their relationship to the rainfall.
4. Chief classes of Indian forests, conifer forests, oak forests, forests of the arid region, sál forests, mixed forests, evergreen forests, littoral forests, humid forests.

FOREST ZOOLOGY.

English Course.

1. The nature of life in general and of animal life in particular.
2. Classification of the animal kingdom, as made up of the following groups:—
   - (*a*) Protozoa (one-celled animals), such as Amœba and Paramœcium;
   - (*b*) Cœlenterata (bag-like animals), such as the little freshwater Hydra;
   - (*c*) Echinodermata (radial animals), such as the star fish;
   - (*d*) Vermes (earthworms, leeches and parasitic worms of all kinds);
   - (*e*) Mollusca (snails, slugs, oysters, &c.);
   - (*f*) Arthropoda (jointed animals), such as crabs, lobsters, cray-fish, spiders, mites, scorpions, centipedes, and insects of all kinds;
   - (*g*) Molluscoidea (sea animals related to the worms);
   - (*h*) Vertebrata (including such lowly animals as the Ascidian and Amphioxus and higher animals, such as fish, amphibia, reptiles, birds, and mammals).
3. The natural history of the Protozoa as illustrated by the simple Paramœcium and Amœba, which are found in stagnant water, and which it is of importance to understand clearly, in order to comprehend the nature of the individual cells of which the bodies of all the higher animals are built up.

4. The natural history of the Cœlenterata as illustrated by Hydra, a small animal found in stagnant water. It is important to be acquainted with the main features of the natural history of this animal, as it helps us to comprehend the nature of the development of the higher animals.

5. The natural history of the Vermes as illustrated by—

(*a*) Earthworms, which are of practical importance in forests as soil changers;

(*b*) Leeches, which are common forest pests;

(*c*) Parasitic worms, such as tape-worms, Trichinæ, thread-worms, and liver flukes which affect men and cattle.

6. The natural history of the Mollusca as illustrated by the common snail.

7. The natural history of the Arthropoda as illustrated by the common cockroach and cray-fish. The group Arthropoda contains not only all the insects and Crustaceans, but also such animals as mites, which are parasitic upon plants and animals, and centipedes, spiders and scorpions, which help to keep down insects and are also in many cases themselves pests.

8. The natural history of the vertebrata as illustrated by the Amphioxus, which may be looked upon as the simplest of all fishes, and by the common frog as typical of lung-breathing animals. The group Vertebrata contains—

(*a*) Fish;

(*b*) Amphibious animals, such as frogs and toads;

(*c*) Reptiles, such as snakes, lizards, crocodiles and turtles;

(*d*) Birds, many of which are of importance in forests, both in connection with the destruction and also with the distribution of seeds, and in connection with the keeping down of injurious insects;

(*e*) Mammals, such as goats, cattle, camels, sheep, elephants, pigs, deer, porcupines, rats, mice, bats, &c.

Goats are excessively destructive owing to their habit of continually cropping young shoots as fast as they sprout; while cattle, camels, sheep, elephants, pigs, deer, and porcupines are all more or less destructive to young trees. Pigs, however, are of use both in rooting up the ground in deodár forests, where the thick matting of fallen pine leaves needlessly interferes with the setting of seed, and also in destroying insects which hybernate beneath the litter, though like rats and mice they also destroy seeds.

9. Elementary dissection of a few common animals such as caterpillars, cockroaches, snails, earthworms and frogs, the object being to enable the student to some extent to see for himself the nature of the vital organs that have been described to him in the lectures as characteristic of the chief groups of which the animal kingdom is made up.

10. *Insects.*—Their position in the animal kingdom, numbers, importance, as destructive to forests and agricultural crops, and as fertilizers of flowers, producers of silk, honey, wax, lac, and dye, and as allies in keeping down each other's numbers. The struggle for existence as affecting insects—instinct, mimicry, distribution in time and space, diseases, parasites, and other natural enemies, including some account of the natural causes and conditions which affect the increase both of injurious and also of useful insects in a forest. The classification of insects into the groups.—Hymenoptera, Lepidoptera, Coleoptera, Diptera, Rhynchota, Orthoptera and Neuroptera.

11. *Hymenoptera.*—Their structure, development, and habits as illustrated by—

(*a*) Social and solitary bees, which store honey and are important as fertilizers of flowers;

(*b*) Social wasps;

(*c*) Sand wasps, which feed their young upon caterpillars and other insects;

(*d*) Ants, as members of intelligent communities;

(*e*) Chrysididæ, Ichneumonidæ, Chalcididæ, and Proctotrupidæ, which are parasitic upon other insects and have a good deal to do with keeping down the numbers of both useful and injurious species upon which they prey;

(*f*) Cynipidæ, or gall insects;

(*g*) Tenthredinidæ, or sand-flies, which are defoliators;

(*h*) Blastophaga, or fig insects, which are essential for the production of seed in some species of the genus Ficus.

12. *Lepidoptera.*—Their structure, development, and habits as illustrated by a few of the forms found in Indian forests. Include the two groups of butterflies and moths. The butterflies are not generally of importance,

though they contain a few defoliating species, but they are of particular interest as presenting several curious cases of mimicry and other arrangements for protecting themselves from their enemies. The moths are divided into numerous groups, amongst which the most important to the forester are—

(*a*) Hepialidæ and their allies, with caterpillars that bore into timber;

(*b*) Lasiocampidæ and their allies, which have hairy caterpillars which are often most injurious as defoliators;

(*c*) Psychidæ, or bag-worms, which are also defoliators;

(*d*) Saturniidæ, which include the tusser, muga and eri silk insects, which are largely cultivated in India for the production of silk, the tusser and muga being reared upon forest trees;

(*e*) The Bombycidæ, which are chiefly important as containing the numerous varieties of mulberry-feeding silk-worms that are cultivated in India.

(*f*) Noctues, which include such insects as cut-worms and boil-worms, and also a few forest defoliators;

(*g*) Geometres, or loopers, some of which are defoliators;

(*h*) Microlepidoptera, which include numerous destructive species, some of which (*e.g.*, the toon-borer) are injurious to forest trees.

13. *Coleoptera* (Beetles).—Their structure, development, and habits as illustrated by some of the forms found in Indian forests. The Coleoptera are divided into numerous groups, of which the following are the most important:—

(*a*) Cicindelidæ and Carabidæ, which are predaceous in their habits and help to keep down the numbers of other insects;

(*b*) Dermestidæ, which are destructive to almost all kinds of stored animal and vegetable matter;

(*c*) Stag beetles, which injure hill oaks by tunnelling into them;

(*d*) Cockchafers and their allies, which are often very destructive in forest nurseries, tea gardens, coffee estates, &c.;

(*e*) Buprestidæ, which are important as wood-borers;
(*f*) Wire-worms, which are destructive to the roots of crops of all kinds;
(*g*) Ptinidæ, which include the bamboo insect and other wood destroyers;
(*h*) Tenebrionidæ, or meal-worms;
(*k*) Bruchidæ, destructive to the seeds of all kinds of leguminous plants;
(*l*) Weevils (Curculionidæ), destructive in numerous ways both to timber and also to seeds and fruits;
(*m*) Bark-borers, which are often very destructive to trees;
(*n*) Longicornes, whose larvæ bore into wood and are most destructive;
(*o*) Phytophaga, injurious as defoliators;
(*p*) Coccinellidæ, which help to keep down plant lice, and in some cases also are injurious as defoliators.

14. *Diptera*.—Their structure, development, and habits as illustrated by—
(*a*) Tachinid flies, which are parasitic upon caterpillars and are most important in keeping down defoliating species;
(*b*) Bot flies, whose larvæ live under the skin and in the digestive organs of cattle.
(*c*) Asilidæ or robber flies, which feed on insects;
(*d*) Fruit flies, which lay their eggs in ripening fruit;
(*e*) Syrphid flies; whose larvæ are useful in destroying plant lice;
(*f*) Mosquitoes;
(*g*) Gall flies (Cecidomyidæ), whose habits are not unlike those of the hymenopterous group Cynipidæ.

15. *Rhynchota*.—Their structure, development, and habits as illustrated by—
(*a*) Aphidæ, or plant lice, which are not only important on account of the injury which they do to plants, but are also interesting on account of their curious life histories and of the organs they have developed to help them to secure the powerful alliance of ants;

(*b*) Coccidæ, which include such useful species as the lac and cochineal insects, and such destructive ones as the scale bugs, which injure coffee, tea, sugar-cane, and numerous other plants;
(*c*) Cicodidæ, which injure trees by depositing their eggs in the bark;
(*d*) Cercopidæ, such as the mango leaf hopper, which injures the productive organs of mango trees;
(*e*) Heteroptera, which includes such insects as the mosquito blight of tea, the rice sapper which injures young rice plants, and the soldier bugs which destroy caterpillars.

16. *Orthoptera.*—Their structure, development, and habits as illustrated by:—
(*a*) Locusts.
(*b*) Cockroaches.
(*c*) White ants.
(*d*) The curious, but from a forest point of view unimportant Mantidæ and Phasmidæ.

17. *Neuroptera.*—Their structure, development, and habits as illustrated by:—
(*a*) Ant lions.
(*b*) Chrysopa flies, whose larvæ destroy plantlice.
(*c*) Caddis flies.

DRAWING, SURVEYING, AND ESTIMATING.*

English Course.

I.—Drawing.

A.—*Theoretical Course*—
1. Freehand.
2. Model.
3. Problems in geometrical drawing which will be of use in Surveying Course and are necessary for construction of scales, &c.

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* Note.—This course extends over the whole 21 months of the instruction as follows:—

Rains term	1st year	I. A.; I. B. 1 to 4; II A.
Winter „	„	II. B. 1 to 6.
Hill Tour	„	Visit to works and notes on roads, bridges, houses, &c.
Rains term	2nd year	I. B. 5 to 8; III.
Winter „	„	II. B. 7.

4. Explanation of terms plan, section, elevation.
5. Use of the more simple instruments, such as the compass, parallel ruler, set squares, &c.
6. Conventional signs and colouring, printing.
7. Hill shading, contour lines.

B.—*Practical Course*—

1. Copying maps, tracing maps.
2. Construction of scales.
3. Enlargement and reduction of maps—
   Pentagraph.
   Method by squares.
   With proportional compasses.
4. Calculation of areas, by triangles, by co-ordinates, by acre comb, by planimeter.
5. Plotting and drawing the results of surveying exercises.
6. Ditto results of levelling.
7. Ditto results of independent survey.
8. Ditto results of road and house and other projects.

II.—Surveying.

A.—*Theoretical Course*—

1. Chain surveying, maintenance and form of field books.
2. Survey with prismatic compass and chain, field book, plotting with protractor.
3. Plane-table survey.
4. Levelling—form of field book, &c.

B.—*Practical Course*—

1. Chain survey.
2. Traverse of roads with prismatic compass and chain.
3. Traverse of boundary of a closed area with prismatic compass and chain. Plotting, rectification of small errors.
4. Plane-table survey.
5. Levelling.
6. Use of maps in the field.
7. Survey (unaided), with prismatic compass and chain, of about a square mile of land, filling in details with plane-table, and levelling or circuit of about half a mile.

III.—Estimating.

A.—*Theoretical*—

1. Projection of lines, outlines of solid geometry.
2. Estimation of volume of earthwork and cost of excavation.
3. Estimation of wall-work, timber, &c.
4. Form of estimate, plan, and specification.

B.—*Practical*—

1. Road project, including—
   (*a*) traverse of road with prismatic compass and chain.
   (*b*) longitudinal section along centre line.
   (*c*) cross sections.
2. Plan, elevation and section of a simple wooden bridge, with estimates for ditto.
3. Plan, elevation and sections of a masonry culvert.
4. Plan, elevation and sections of a Range Head-quarters house.
5. Repairs to houses and estimates for ditto.

FOREST ENGINEERING.

English Course.

I.—*Building Materials*—

1. Stone—
   (*a*) The various qualities.
   (*b*) Method of extraction and preparation.
2. Brick—
   (*a*) The various qualities.
   (*b*) Preparation, including the various methods of moulding and burning.
3. Earth—
   (*a*) Qualities suitable for building.
   (*b*) Method of preparation.
4. Tiles—Flat and hollow; method of manufacture.
5. Lime—
   (*a*) Various qualities of limestone.
   (*b*) Preparation.
   (*c*) Storing.
   (*d*) Its different uses in construction.
6. Timber—
   (*a*) Preparation and seasoning.
   (*b*) Suitability for various parts of the structure, in reference to qualities of various species.

(*c*) Some of the more important timber used in construction—Teak, Sál, Deodar, &c.
(*d*) Preparations for preserving and beautifying wood: paints, varnishes, tar, &c.
(*e*) Carpentry and joinery, including the more common and useful joints, scarfs, mortices, trusses and scantlings, doors, windows, railings, &c.

II.—*Building*—

1.—Foundations—
(*a*) Selection of site; soils.
(*b*) Excavation.
(*c*) Materials used, concretes.
(*d*) Plinths.

2. Walls—
(*a*) Construction in various materials.
(*b*) Thickness relatively to height and nature of roofing.

3. Arches: in doorways, culverts and roofs.

4. Floors: terraced, tiled, wooden, asphalt, earth. Construction and protection from insects and damp.

5. Roofs—
(*a*) Terraced, tiled, shingle, thatched, iron roofs. Construction and comparative advantages of weight, durability, coolness, and cost.
(*b*) Method of support, beams, trusses, rails, &c.

6. Chimneys and fireplaces. Main principles of construction, including safety chimneys, flues, &c.

7. Drainage, lightning conductors and other details.

8. Plans, specification, estimates, and especially working drawings.

III.—*Road-making*—

1. Roads, temporary and permanent, cart-roads, sledge-roads, inspection and bridle-paths in the hills and plains.

2. Alignment of roads in hills and plains as affected by necessities of export, such as carriage employed and direction of export, with special reference to gradients and avoidance of physical difficulties.

3. Methods of laying out roads in level country, or in country with definite gradients, with levels, road-tracers &c.; curves, drainage, &c.

4. Construction, earthwork, stone-cutting, and rock-blasting, embankments and cuttings, metalling.

5. Estimates.

IV.—*Bridges*—
1. General principles regulating height and span.
2. Different principles employed in construction.
3. Selection of sites and laying out approaches.
4. Simple wooden bridges and with trusses.
5. Simple wire-rope bridges.
6. Rail bridges.
7. Masonry culverts.
8. Estimates.

V.—*Transport of Timber*—
1. Simple transport carriage by carts, beasts of burden, and coolies.
2. Sledge roads.
3. Tramways.
4. Wet and dry slides.
5. Transport by water, including rafting and floating.

VI.—*Wells*—
1. Permanent and temporary, wood and masonry.
2. Selection of sites in reference to the varioussoils.
3. Construction; methods of sinking.
4. Cleaning and protection.

VII.—*Water and River Bank Works*—
1. Embankments and dams for retaining water.
2. Simple canals.
3. Masonry bunds for protection of river and torrent banks.
4. Spurs and cribs for ditto.

VIII.—*Demarcation*—
1. Boundary marks: various kinds of marks used according to character of country and materials available.
2. Boundary lines, rides, and roads.
3. Block and compartment lines.

FOREST LAW.

English Course.

General Notions regarding Property.

I.—General Law—

1. Of property and its acquisition.
2. Of possession.

3. The consequences of possession.
4. The transfer of property.

General Notions regarding Rights and Servitudes.

5. Their nature.
6. Distinction between servitudes and ownership. The Easements Act, and Statute of Limitations.

Of Government Property and its Acquisition.

7. Estates held by succession from former Governments.
8. Lands occupied by roads, canals, river-beds, railways, &c.
9. Waste lands.
10. Lands acquired for public purposes.

II.—Forest Law—

Of Forest Law in India.

1. Reasons for special law.
2. Forest Laws in Europe and in India. The Indian Forest Acts and Regulations.
3. To what lands the special laws apply.
4. The constitution of permanent Forest Estates in India.
5. Of the protection of trees and natural produce on lands not being forests.

The Limitation to which Rights of User are subject.

6. The principle that rights must be limited and regulated.
7. The extent of the limitation.
8. Principles of regulation applied to different classes of rights.
9. Grazing rights.
10. Grass-cutting.
11. Lopping for fodder and leaf gathering.
12. Wood rights.
13. Removal of dead leaves.
14. Other forest produce.
15. Hunting and shooting.
16. Temporary and shifting cultivation.

The Procedure for Constituting Permanent Forest Estates.

17. The preliminary steps. Difference of procedure under different Acts. Rules for the conduct of Forest Settlement procedure. Importance of exact adherence to legal procedure.
18. Claims to land.
19. Claims to rights of way or of water.
20. Claims to other forest rights.
21. Definition of rights admitted to exist.
22. Method of providing for admitted and defined rights.
23. Commutation of forest rights.
24. Extinction of unclaimed rights.
25. Appeals from orders of a Forest Settlement Officer or Court.
26. Final notification. Importance of accurate description.
27. Forests reserved previous to the passing of the different Acts.
28. Privileges and concessions granted by Government, though not legally proved to be rights of the nature of easements; their regulation.
29. Village forests.
30. Protected forests.
31. Undivided or shared forests.
32. Control over private forests.
33. Rules made under the various Forest Acts and Regulations.

III.—Criminal Law applied to the Protection of Forests and their Produce in transit—

1. Protection against natural calamities.
2. Protection against fire.
3. Protection against offences by human agency.
4. Preventive provisions.
5. The law under which offences are punished.

Application of the Forest Acts to Forest Offences.

6. Offences against the forest itself—
   (*a*) Reserved forests.
   (*b*) Protected forests.
7. Special offences.

8. Cattle trespass. The Cattle Trespass Act.
9. Control of timber in transit and offences connected with it—
   (*a*) Transit by land.
   (*b*) Ditto water.
   (*c*) Drift timber and salving.
   (*d*) Rules regarding drift timber and its disposal.

Application of the Penal Code to Forest Offences.

10. Offences directly connected with a forest or its produce—
   (*a*) Theft or criminal misappropriation.
   (*b*) Receiving stolen property.
   (*c*) Mischief.
   (*d*) Abetment of offences.
   (*e*) Criminal trespass.
   (*f*) Attempt to commit offences.
11. Offences indirectly connected with a forest or its produce—
   (*a*) Unlawful assembly.
   (*b*) Omitting to give aid and information.
   (*c*) Giving false information.
   (*d*) Giving false evidence.
   (*e*) Concealing offenders.

General Principles of Criminal Law relating to Offences.

12. General exceptions (excusing offences).
13. Circumstances aggravating offences.
14. Limitation of time for prosecution.
15. Remarks on conduct of prosecution.

The Legal Principles of Punishment.

16. Imprisonment and fine.
17. Confiscation as a punishment under Forest Law.

The Criminal Procedure Law.

18. Complement to the penal laws.
19. Investigation by the Police—
   (*a*) Cognizable offences.
   (*b*) Non-cognizable.
20. Cases on complaint to the Magistrate.
21. The process of Criminal Courts.
22. Criminal trials.

23. Method of obtaining attendance of witness; record of evidence; notes on the Evidence Act.
24. The charges.
25. Execution of sentence and recovery of fines.
26. Appeal and revision.

IV.—The Forest Service—

1. General nature of the Forest Service.
2. The appointment of Forest Officers and organization of the service.
3. The special responsibilities of Forest Officers.
4. The protection extended by law to Forest Officers.
5. The legal powers of Forest Officers.
6. Offences against the authority of public servants.

FOREST ACCOUNTS AND PROCEDURE.

English and Vernacular Courses.

I.—*General principles of book-keeping by single entry.*

II.—*Cash Accounts*—

(*a*) Classification of Revenue and Expenditure.
(*b*) "Capital" and "Ordinary Expenditure," and powers of sanction.
(*c*) The Cash Book and how to keep it.
(*d*) Advances and recoveries of cash, and how they should be dealt with.
(*e*) Vouchers and registers subsidiary to the cash-book.
(*f*) Revenue, and procedure as to receiving, remitting, or refunding same.
(*g*) The divisional cash accounts and monthly returns. How to prepare them.

III.—*Forest produce and yield returns*—

(*a*) Accounts and returns connected with the departmental export of produce.
(*b*) Accounts and returns connected with the removal of produce by purchasers.
(*c*) Working-Plan returns and forest journals.

IV.—*General Procedure*—

(*a*) Correspondence—how to be dealt with, registers to be kept up, and rules regarding records.
(*b*) Transfer of charge.

TIME-TABLE FOR

SENIOR

Time.	Subject.	Day of the Week.	Room.
7 to 8-30 A.M.	Accounts ...	Tuesday, Thursday	Western Lecture Room
	Drawing ...	Monday, Wednesday, Friday	Corridor ...
8-30 to 10 A.M.	Surveying and Forest Engineering	Daily July and August	Drawing Hall ...
	Zoology ...	Daily September and October	Eastern Lecture Room
12 Noon to 1-30 P.M.	Forestry ...	Daily ...	Central Lecture Room
1-30 to 3 P.M.	Forest Law ...	Tuesday, Thursday July and Daily August	Eastern Lecture Room
	Botany ...	Monday, Wednesday, Friday July	Ditto. ...
	Forest Engineering	Daily September	Drawing Hall ...
	Botany ...	„ October ...	Eastern Lecture Room
4—5 P.M. ...	Drill ...	Tuesdays and Thursdays.	

SENIOR

7 to 8-30 A.M.	Accounts ...	Tuesday, Thursday.	Western Lecture Room
	Drawing ...	Monday, Wednesday, Friday.	Western small Room
8-30 to 10 A.M.	Surveying and Forest Engineering	Daily ...	Drawing Hall ...
12 Noon to 1-30 P.M.	Forestry ...	„ ...	Eastern small Lecture Room
1-30 to 3 P.M.	Forest Law ...	Tuesday, Thursday.	Ditto. ...
	Botany ...	Monday, Wednesday, Thursday.	Western small Lecture Room
4—5 P.M. ...	Drill ...	Tuesdays and Thursdays	

RAINS TERM 1891.

UPPER CLASS.

Name of Professor.	REMARKS.
Babu Kasheeshwar Mukerjee, Head Clerk, School Circle	General Principles I, July 2, 7; Cash Accounts II, July 9th to August 13th; Returns III, August 18th to September 3rd; Procedure IV, September 8th to 15th; Practical Examples till October 27th.
The Instructors ...	III B 1, Road Project, July; III B 2, 3 Bridges, August; III 4 Buildings, September; Revision I B 3 and 4, October.
Instructor, Mr. C. G. Rogers	Estimating A in July, Forest Engineering IV to VIII, August.
Mr. E C. Cotes, 1st Asst Supt., Calcutta Central Museum	Zoology.
Deputy Director ...	Utilization, July, August; Working Plans September, October.
Mr N. Hearle, Deputy Conservator of Forests	General Law I, July 2, 14; Forest Law II, July 16th to September 3rd; Criminal Law &c. III, 8th to October 15th; Forest Service IV, October 20th to 27th.
Instructor, Mr. C. G. Rogers	Morphology I.
Ditto. ...	Revision of Course.
Mr G Gammie, Director of Botany, Northern India	Classification V.

LOWER CLASS.

Babu Kasheeshwar Mukerjee	With Senior Upper Class.
The Instructors	
Ditto.	
Hindustani Instructor	
Ditto.	
Babu Birbal	

Time Table for Rains

JUNIOR

Time.	Subject.	Day of the Week.	Room.
7 to 8 30 A.M.	Forestry ...	Tuesday, Thursday	Central Lecture Room
	Drawing ...	Monday, Wednesday, Friday	Drawing Hall ...
8-30 to 10 A.M.	Natural Science	Daily ...	Western Lecture Room
12 Noon to 1-30 P.M.	Surveying and Forest Engineering	Daily ...	Drawing Hall ...
1-30 to 3 P.M.	Mathematics	Tuesday, Thursday	Western Lecture Room
	Botany ...	Monday, Wednesday, Friday	Ditto ...
4—5 P.M. ...	Drill ...	Tuesdays and Thursdays	

JUNIOR

7 to 8-30 A.M.	Forestry ...	Tuesday, Thursday	Eastern small Lecture Room
	Drawing ...	Monday, Wednesday, Friday	Drawing Hall ...
8-30 to 9-30 A.M.	Mathematics	Daily ...	Western small Lecture Room
12 Noon to 1-30 P.M.	Natural Science	„ ...	Ditto. ...
1-30 to 3 P.M.	Forest Law ...	Tuesday, Thursday	Eastern small Lecture Room
	Botany ...	Monday, Wednesday, Friday	Western small Lecture Room
4—5 P.M. ...	Drill ...	Tuesdays and Thursdays	

Term 1891—(*Continued*).

UPPER CLASS.

Name of Professor.	REMARKS.
Deputy Director ...	Sylviculture S IV, Artificial Reproduction.
The Instructors ...	Drawing I, B 1 to 4.
Instructor, Mr. A. F. Gradon	Chemistry, July 1st to 23rd; Physics, July 24th to August 17th; Physiography, August 18th to September 11th; Geology, September 14th to October 16th; Soils, October 7th to October 28th.
Instructor, Mr. C. G. Rogers	Drawing I A, 1st to 7th July; Surveying II A, August; Forest Engineering I, II, III, September, October.
Mr. A. P. Grenfell, Asst. Conservator of Forests	Algebra I, to July 28th; Trigonometry II, to August 18th, Mensuration III, to September 15th, Statics, IV, to October 18th; Dynamics and Hydrostatics V, VI, to October 27th.
Instructor, Mr. A. F. Gradon	Morphology I, July 1st to 24th; Anatomy II, July 27th to August 21st; Physiology III, August 24th to September 14th; Wounds and Diseases IV, September 21st to October 14th; Geography VI, October 16th to 28th.

LOWER CLASS.

Hindustani Instructor.	
The Instructors.	
Babu Gopal Singh.	
Babu Birbal, Forest Ranger.	
Hindustani Instructor ...	With Senior Lower Class.
Babu Birbal ...	Ditto. ditto.

LIST OF STUDENTS ON JANUARY 1st, 1892.

Senior Students (Entered July 1st, 1891).

Upper Class.

A. H. Mee	Bengal, Lr. Provinces.
L. K. Martin	N. W. Provinces and Oudh.
Mehdi Hasan	
Devi Dayal	Punjab.
Karam Chand	
Hamid-ud-din	
Gholam-ul-lah	
C. W. B. Anderson ...	Central Provinces.
Amrito Lal Chatterjee ...	
R. C. Thompson	
F. W. Wightman ...	
Ganga Prasad Khatri ...	
Krishnama Achari ...	Madras.
F. A. Seager	
K. Aswathama Naidu ...	
W. H. Blacker	
R. S. Bower	
P. W. Healy	Burma.
Maung Charlie	
Maung Henry	
A. M. Walker	Ceylon.
G. V. Sarangpani ...	Baroda State.
M. Kavanagh	Private.
G. Knowles	
S. R. Parsons	

Lower Class.

Jaimal Sing	N. W. Provinces and Oudh.
Nathu Sing	
Hafizullah Khan ...	
Uttam Sing	
Bhairon Pershad ...	Central Provinces.
Daulat Ram	Jeypore State.

Junior Students (Entered July 1st, 1891).

Upper Class.

Ram Nath Mukerjee ...	Assam.
Kali Charan Varma ...	N. W. Provinces and Oudh.
Kanhya Lal	
Ram Chandra	

Gurditta Mall *	Punjab.
Bodh Raj	
Gurbakhsh Rai	
Duni Chand	
Abdul Haq	
R. H. Cole	Central Provinces.
Dhanjishah Avasia ...	
Rajagopal Naidu ...	Madras.
A. P. Ramachandra Mudaliar	
T. Munisawmy Naicker ...	
N. S. Anantacharlu ...	
L. Venkanna	
S. Kuppusawmy Chetty ...	
A. B. Myers	
K. Gajaraju Mudaliar ...	
W. B. Jackson	
H. E. Kelly	
E. J. D. Pierce	
S. Ramaswmiah Iyer ...	
T. Arumugam Mudaliar ...	
P. Venkatakrishnamah Naidu	
C. E. Allen	
T. S. Brito	
W. J. Lane-Ryan ...	Burma.
Hari Keshav Washikar ...	Kolhapur State.
Gopal Krishna	Hyderabad State.
Krishnaji Javadekar ...	
A. M. Sawyer	Travancore State.
Bhawani Das	Jodhpore State.
W. G. J. Peake ...	Private.
D. H. Allan	
R. L. Pocock	
C. S. Rogers	
J. A. Firth	
R. F. Colaço	
P. S. Govinda Rao ...	
V. Ethirajulu Naidu ...	

Lower Class.

Harji Ram	N. W. P. and Oudh.
Shyam Sundra	Jeypore State.
Akbar Khan	Private.
Sunder Lal	

LIST OF PASSED STUDENTS OF

Name.	Date of Certificate.		Character of Certificate.
J. C. Mendes		1881	R.
Shama Churn Chuckerbutty ...		„	R.
A. E. Lowrie		1882	S. A. C.
Karuna Nidhan Mukerji		„	S. A. C.
Fazl Din (II)		„	R.
Moti Singh	28th Nov.	„	R.
Daulat Ram Bimbhat	„	„	R.
Kripa Nath De	„	„	R.
Chunder Kumar Chatterji	„	„	S. A. C.
Jogesvar Súr	1st Nov.	1883	R.
Mahadeo Rao Palnaitkar	„	„	R.
C. Ingram	„	„	R.
Sadhu Singh	„	„	R.
Raghúnath Pathak	„	„	R.
Kedar Nath Mozumdar	„	„	R.
Dina Nath Kar	„	„	R.
Rama Nand	„	„	R.
Sundar Lal	„	„	R.
Ghúlam Mahomed (I)	„	„	R.
Gurditt Singh	„	„	R.
Bhukan	„	„	R.
Nanak Chand	1st Jan.	1884	F.
Maung H. Pe	„	„	F.
Maung Tun	„	„	F.
Ram Narayan	„	„	F.
Tara Kisor Gupta	Dec.	„	R.*
Harswarup (I)	„	„	R.*
Gokal Das	„	„	R.
Thakúr Das	„	„	R.
Ghulam Mahomed (II)	„	„	R.
V. S. Gurunatha Pillai	„	„	R.
Sada Nand Gairola	„	„	R.
Narayen Prashad	„	„	R.
Tincauri Chaudhri	„	„	R.
Mansukh Rai	„	„	R.
Rakhal Das Mukerji	„	„	R.
Maung Shwe Ka	„	„	R.
Jai Kishen	„	„	R.
Maung Thakado	„	„	R.
Abdul Rahman Sahib	„	„	F.
Atma Ram	4th Jan.	1885	R.
Devi Ditta	„	„	R.
C. P. Howell	„	„	R.
Keshava Nand	„	„	R.*
Nand Mal	„	„	R.
C. M. Maduranayagam Pillai ...	„	„	R.
Kongandra Ponnappa	„	„	R.
Sundar Das	„	„	R.
C. L. Toussaint	„	„	R.
Maung Khan Hein	„	„	F.

THE IMPERIAL FOREST SCHOOL.

Where employed on 1st January 1892.	Rank on 1st January 1892.
Bengal	Extra Assistant Conservator.
"	" "
Central Provinces ...	Assistant Conservator.
N. W. P. and Oudh ...	Extra Assistant Conservator.
Panjab	" "
"	Forest Ranger.
Jodhpur State ...	Supdt. of Forest Department.
Assam	Forest Ranger.
Central Provinces ...	Extra Assistant Conservator.
Assam	" "
... ...	(Deceased).
Burma	Extra Assistant Conservator.
Jeypore State ...	Superintendent of Forests.
N. W. P. and Oudh ...	Extra Assistant Conservator.
Bengal	Forest Ranger, Offg. Extra Asst. Conser.
"	
'anjab	Forest Ranger.
'atiala State ...	Chief Forest Officer.
'anjab	Forest Ranger.
'apurthala State ...	" Officer.
'erar	Proby. Extra Assistant Conservator.
... ...	(Deceased).
'urma	Forest Ranger.
"	" "
'. W. P. and Oudh ...	" "
.ssam	Extra Assistant Conservator.
'. W. P. and Oudh ...	" "
'anjab	Forest Ranger.
"	" "
"	" "
'adras	Extra Assistant Conservator.
'. W. P. and Oudh ...	Forest Ranger.
'entral Provinces ...	" "
'erar	Extra Assistant Conservator.
'urma	Extra Assistant Conservator.
anjab	Forest Ranger.
'urma	Extra Assistant Conservator.
'adras	Forester.
anjab	Forest Ranger.
"	" "
'adras	Extra Assistant Conservator.
'. W. P. and Oudh ...	" "
jmere	Forest Ranger.
'adras	" "
oorg	" "
anjab	" "
Burma	Assistant Conservator.
" ...	Myook.

List of Passed Students of the

Name.	Date of Certificate.	Character of Certificate
Gour Krishna Sircar	30th Oct. 1885	F.
Harswarup (II)	,, ,,	F.
Bagh Singh	1st Jan. 1887	F.
Mukandi Lal	,, ,,	F.
Pancham Singh	,, ,,	F.
Rama Dutt	,, ,,	F.
Upendra Datt	,, ,,	F.
E. M. Buchanan'	3rd March ,,	R.*
Ramaswami Ayer	,, ,,	R.*
Sita Ramaiya	,, ,,	R.*
Venkata Narain Appa	,, ,,	R.
T. Bapú Ráo	,, ,,	R.
Chintamani Joshi	,, ,,	R.
V. C. Doraswami Pillai ...	,, ,,	R.
Jawala Parshad	,, ,,	R.
L. A. R. Kershaw	,, ,,	R.
S. C. Moss	,, ,,	R.
Manbir Gurang	,, ,,	R.
Mulraj	,, ,,	R.
K. Narayana Swami Aiyar	,, ,,	R.
Parmeswari Din	,, ,,	R.
N. M. Rego	,, ,,	R.
Ram Chunder Krishna	,, ,,	R.
Sheo Baksh	,, ,,	R.
Suraj Rai Karúna Shankar ...	,, ,,	R.
Alamdar Husain	,, ,,	F.
Rama Nand	,, ,,	F.
Harnam Singh	28th March ,,	F.
Palekandra Atchiah	9th July ,,	R.
Bhaskar Rao	,, ,,	R.
Beli Ram	,, ,,	R.
Choga Lall	,, ,,	R.
Mangal Sain	,, ,,	R.
A. Eggia Sastri	,, ,,	R.
S. Eggia Narayana Shastri ...	,, ,,	F. R.
M. L. Narayana Shastri	,, ,,	R.
Jodh Singh	,, ,,	F.
Badri Datt	15th Dec. ,,	F.
Gajadhar	,, ,,	F.
Hans Raj	,, ,,	F.
Jagbandan Singh	,, ,,	F.
Madho Ram	,, ,,	F.
Manohar Singh	,, ,,	F.
Natha Singh	,, ,,	F.
Randaman Singh	,, ,,	F.
Sheikh Chand	,, ,,	F.
Jot Ram	,, ,,	F.
Pirbhú Lal	,, ,,	F.
A. N. Hanumantha Rao	19th March 1888	R.
Madho Pershad	,, ,,	R.

Imperial Forest School—(*Continued*).

Where employed on 1st January 1892.	Rank on 1st January 1892.
Bengal	Forest Ranger.
N. W. P. and Oudh ...	" "
" " ...	Forester.
" " ...	"
" " ...	Forest Ranger.
" " ...	" "
" " ...	Forester.
Burma	Extra Assistant Conservator.
Mysore State ...	Assistant Conservator.
"	" "
"	
Madras	Forest Ranger.
Madras	Forest Ranger.
Panjab	Extra Assistant Conservator.
Sirohi State	
Madras	Extra Assistant Conservator.
Nepal	
Baluchistan ...	Forest Ranger.
Madras	" "
N. W. P. and Oudh ...	" "
Madras	Forest Ranger.
Central Provinces ...	Extra Assistant Conservator.
Jeypore State ...	
Baroda State ...	
... ...	(Resigned).
Patiala State ...	
Punjab	Forest Ranger.
Coorg	" "
Panjab	Forest Ranger.
Central Provinces ...	" "
Panjab	" "
Madras	" "
"	" "
"	" "
N. W. P. and Oudh ...	Forester.
" " ...	"
" " ...	"
... ...	(Deceased).
Rewa State	
N. W. P. and Oudh ...	Forester.
" " ...	"
Punjab ...	Forest Ranger.
Rewa State	
... ...	(Deceased).
N. W. P. and Oudh ...	Forester
" " ...	Forest Ranger.
Madras	" "
N. W. P. and Oudh ...	" "

List of Passed Students of the

Name.	Date of Certificate.	Character of Certificate.
T. Malaya Pillai	19th March 1888	R.
J. G. F. Marshall	,, ,,	R.
N. Nagarazú	,, ,,	R.
Pandurang Narayen	,, ,,	R.
Ram Narayan	,, ,,	R.
A. F. X. Saldanha	,, ,,	R.
Saradindú Goswami	,, ,,	R.
G. H. Wiśtenbaker	23rd March ,,	F.
Nikunji Bihari Nandi	,, ,,	F.
Rastumji	14th July ,,	R.
Chajjú Ram	,, ,,	R.
Imam-ud-Din	,, ,,	R.
E. E. Slane	,, ,,	R.
Surappa Iyer	,, ,,	R.
J. Tapp	,, ,,	F.
Radha Kishen	28th Dec. ,,	F.
Mukat Bihari Lal	25th March 1889	R.*
V. Alwar Chetty, B.A.	,, ,,	R.
Achru Ram	,, ,,	R.
D. L. K. Calderwood	,, ,,	R.
S. Eggia Narayana Shastri	,, ,,	R.
T. N. Hearsey	,, ,,	R.
J. J. Hobday, B.A.	,, ,,	R.
Jagat Ram	,, ,,	R.
Kamrud-din	,, ,,	R.
E. C. M. Mascarenhas	,, ,,	R.
W. R. McCay	,, ,,	R.
Nand Lal	,, ,,	R.
Nava Kumar Seth	,, ,,	R.
R. Quinnell	,, ,,	R.
Raghubans Sahaya	,, ,,	R.
J. W. Ryan	,, ,,	R.
C. Subramania Aiyar	,, ,,	F.
Akbar Ali	,, ,,	F.
Arjún Singh	,, ,,	F.
Jodh Singh	,, ,,	F.
Kundan Lal	7th July ,,	R.
E. J. N. James	,, ,,	R.
Brindaban Chandra Ghosal ...	,, ,,	R.
Parshadi Lal	,, ,,	R.
M. L. Haslett	,, ,,	R.
Kampta Parshad	,, ,,	R.
Arokiasawmy Pillai	,, ,,	R.
L. Hanumanthulu	,, ,,	R.
P. R. Rathnasawmy Pillai ...	,, ,,	R.
C. H. Haldane	March 1890	R.*
M. Rama Rao	,, ,,	R.*
S. G. Paranjpe, B.A.	,, ,,	R.
Gulab Rai	,, ,,	R.
Krishna Nandjoshi	,, ,,	R.

Imperial Forest School—(*Continued*).

Where employed on 1st January 1892.	Rank on 1st January 1892.
Madras	Forest Ranger.
"	Extra Assistant Conservator.
"	Forest Ranger.
Berar	" "
N. W. P. and Oudh ...	" "
Madras	Forest Ranger.
... ...	(Dismissed).
... ...	Forester.
Panjab	Forest Ranger.
"	" "
Bengal	Extra Assistant Conservator.
Madras	Forest Ranger.
Jeypore State ...	
Central Provinces ...	Forester.
Madras	Extra Assistant Conservator.
Burma	Extra Assistant Conservator.
Madras	Forest Ranger.
"	Extra Assistant Conservator.
Central Provinces ...	" "
Punjab	Forest Ranger.
... ...	(Deceased).
Madras	Forest Ranger.
"	" "
Punjab	" "
Bengal	Extra Assistant Conservator.
N. W. P. and Oudh ...	Forest Ranger.
Madras	" "
"	" "
N. W. P. and Oudh ...	Forester.
Central Provinces ...	"
N. W. P. and Oudh ...	"
Central Provinces ...	Forest Ranger.
Bengal	Extra Assistant Conservator.
"	Forest Ranger.
N. W. P. and Oudh ...	" "
" " ...	Extra Assistant Conservator.
" " ...	Forest Ranger.
Madras	" "
"	Forester.
"	Forest Ranger.
Berar	Extra Assistant Conservator.
Madras	Forest Ranger.
Central Provinces ...	Extra Assistant Conservator.
N. W. P. and Oudh ...	Forest Ranger.

List of Passed Students of the

Name.	Date of Certificate.	Character of Certificate.
Nawazish Ali	March 1890	R.
G. W. Thompson	„ „	R.
Faiz Baksh	„ „	R.
Nilkantha Mukherji	„ „	R.
K. Rama Rao	„ „	R.
A. Tatham	„ „	R.
Aruri Ram	„ „	R.
Prithvi Sirgh	„ „	F*
Tolu Ram	„ „	F.
Ghulam Haidar	„ „	F.
E. B. Powell	14th July „	R.
Ram Chand	„ „	F.
W. A. Hearsey	4th Dec. „	R.
Upendra Nath Kanjilal	1st April 1891	R.*
B. Heera Singh, B.A.	„ „	R*
C. Appaya, B.A.	„ „	R*
A. R Rama Rao	„ „	R.
V. Kalyanarama Aiyar	„ „	R.
M. G. Rama Rao, B.A.	„ „	R.
N. C. McLeod	„ „	R.
R. F. Lowis	„ „	R.
H. Srinivása Rao	„ „	R.
M. Srinivásu Rao	„ „	R.
Srinivasu Naidalu	„ „	R.
Punnoswami Mudaliar	„ „	R.
A. T. C. Howell	„ „	R.
Mehar Chand	„ „	R.
F. Ryan	„ „	R.
W. G. Gilmore	„ „	R.
Anantarama Iyengar	„ „	R.
Inmati Shama Rao	„ „	R.
J. P. Haslett	„ „	R.
Jiwa Ram	„ „	R.
Guru Das Chatterji	„ „	R.
Narasinha Murti Rao	„ „	R.
A. Hunt	„ „	R.
W. Ferguson	„ „	R.
Bhaya Lal Dubo	„ „	F.*
Jagan Nath	„ „	F.
Jehangiri Lal	„ „	F.
Dhondo Narayan	„ „	F.
Pyaro Lal	„ „	F.
Ram Prasada Tiwari	„ „	F.
Nand Lal	„ „	F.
Narayan Chandra Datt	„ „	F.
Ajodhya Prasada	7th October „	F.
D. Barrow	15th „ „	F.
Rajendra Lal Shawe	22nd „ „	F.

Imperial Forest School—(*Continued*).

Where employed on 1st January 1892.	Rank on 1st January 1892.
Panjab	Forest Ranger.
Madras	" "
Central Provinces ...	" "
Assam	" "
Madras	" "
Ceylon	Assistant Conservator.
Panjab	Forest Ranger.
Nahan State ...	" "
Burma	Extra Assistant Conservator.
Burma	Extra Assistant Conservator.
Assam	Forest Ranger. Instructor, Forest School.
Mysore State ...	" Probationer.
" ...	" "
Madras	" Ranger.
"	" "
Mysore State ...	" "
Central Provinces ...	Extra Assistant Conservator.
Burma	" "
Mysore State ...	Forest Ranger.
" ...	" "
Berar	Probationary Extra Assistant Conservator.
Central Provinces ...	Forest Ranger.
" ...	" "
Panjab	Forester.
N. W. P. and Oudh ...	Forest Ranger.
Central Provinces ...	" "
Mysore State ...	" "
Central Provinces ...	" "
" ...	" "
Jubal State	
Bengal	Forester.
Mysore State ...	Forest Ranger.
Central Provinces ...	" "
Ceylon	Assistant Conservator.
Central Provinces ...	Forester.
Marwar State ...	Forest Ranger.
Kotaha State ...	
Central Provinces ...	Forester.
Kalsia State ...	
... ...	(Deceased).
Nalagarh State ...	
Central Provinces ...	Forester.
Ulwar State ...	"
N. W. P. and Oudh ...	"
Central Provinces ...	"

LIST OF DIRECTORS OF THE IMPERIAL FOREST SCHOOL SINCE ITS INSTITUTION.

Name.	From.	To.
Capt. (then Major) F. Bailey, R.E.,	Sept. 1, 1878	Oct. 31, 1881.
Major G. J. VanSomeren, (Offg.) ...	Nov. 1, 1881	May 10, 1882.
Major F. Bailey, R.E., ...	May 11, 1882	Feb. 21, 1884.
W. R. Fisher, Esq., (Offg.) ...	Feb. 22, 1884	Dec. 15, 1884.
E. E. Fernandez, Esq., (Offg.) ...	Dec. 16, 1884	Mar. 15, 1885.
W. R. Fisher, Esq., (Offg.) ...	Mar. 16, 1885	Jan. 1, 1889.
E. E. Fernandez, Esq., (Offg.) ...	Jan. 2, 1889	Jan. 15, 1889.
Lieut.-Colonel F. Bailey, R.E., ...	Jan. 16, 1889	June 10, 1889.
E. E. Fernandez, Esq., (Offg,) ...	June 11, 1889	Aug. 22, 1889.
Lieut.-Colonel F. Bailey, R.E, ...	Aug. 23, 1889	.....
Colonel G. J. VanSomeren, (Offg.)	Aug. 24, 1889	Nov. 23, 1889.
Lieut.-Colonel F. Bailey, R.E., ...	Nov. 24, 1889	Mar. 23, 1890.
C. Bagshawe, Esq., ...	Mar. 24, 1890	Oct. 13, 1890.
J. S. Gamble, Esq., ...	Oct. 14, 1890	

RULES FOR THE OCCUPATION OF STUDENTS' QUARTERS.

1. The Range of Quarters consists of sixteen rooms, each of which is intended for the accommodation of two students. The rooms will usually be allotted equally to the Senior and Junior classes.

2. Quarters will be allotted at the beginning of each Rains Term by the Director. On making the allotment he will usually give precedence in order of application.

3. Forest Rangers and Foresters on the permanent staff of the Forest Department will usually be held to have prior claim to quarters.

4. The rent of each of the sixteen sets of Quarters will be Rupees 4 per mensem, *i.e.* each student will have to pay Rs. 2 per mensem during the whole period of his occupation. This rent will be deducted monthly from his subsistence allowance.

5. No student may give up his Quarters, except on the completion of his course, without the written permission in each case of the Director; and no student may under any circumstances sub-let his Quarters or allow any one else to occupy them, for *any* length of time.

6. The cook-rooms behind the Quarters will be allotted among the occupants of the Quarters, who will be held responsible that their servants using them maintain them clean and in good order.

7. Sweepers (usually 3) will be maintained under the authority of the Director for the purpose of cleaning Quarters and cook-rooms and to assist in the latrines. Each student occupying Quarters will contribute 8 annas per mensem towards the pay of these men who will also follow the camp on tour.

8. All Quarters and cook-rooms must be kept neat and clean and well ventilated and the Director and Deputy Director will make frequent inspections to see that this rule is carried out.

9. No bedsteads, boxes or articles other than tables or chairs shall be placed in the verandah or in the

spaces between rooms during the day time, and then only temporarily, the owner being present.

10. No dogs are allowed in Quarters, or anywhere within the School precincts.

11. The tank in front of the cook-rooms is provided only for the washing of cooking pots and similar utensils and then only after such utensils have been scrubbed with sand. The water in which such utensils have been cleaned is not to be allowed to return into the tank. Bathing on the edge of the tank is strictly prohibited.

12. The washing places are not to be used for any but bathing purposes.

13. Receptacles will be provided outside the cook-rooms, into which all solid refuse must be emptied for removal by the sweeper.

14. Students are responsible for all acts committed by, and for the behaviour of, their servants.

15. Students occupying Quarters are responsible for all damage done to their Quarters and no enquiry will necessarily be made; but each student will be charged for such damage at a rate which will be fixed by the Director in each case.

16. Each student will be provided with one table and one chair and if available a bedstead. All other furniture must be provided by the student himself.

BOOKS AND INSTRUMENTS REQUIRED BY STUDENTS.

1. Students who join the Imperial Forest School for the English class of 1891-93 will be expected to provide themselves with the following books and Instruments at once. They can be obtained from the School Storekeeper.

1 Todhunter's Trigonometry.
1 „ Algebra.
1 „ Mensuration.
1 Barnard Smith's Arithmetic.
1 Hamblin Smith's Statics.
1 Tables of Logarithms.
1 Rurki Surveying Manual.
1 Fernandez's Smaller Forestry Manual (when published fully).
5 Primers of Botany, Physical Geography, Geology, Chemistry and Physics.
1 Smythies' list of Dún Trees &c.
1 Magnifying glass.
1 Small pair botanical pincers.
1 2 feet measuring rule.
1 6 feet nickel case tape.
1 Small box mathematical instruments containing compasses, bow-pen and protractor.
1 Architects' Rule.
2 Set Squares 45° and 60°.
1 Card protractor.
1 Dozen drawing pins.
3 Brushes of sizes.
4 Pencils 1 H.H., 1 H., 2 H.B.
1 Piece India rubber.
1 Piece Indian ink.
6 Drawing nibs with holder.
10 Cakes colours, green, vermillion, sienna, cobalt, gamboge, yellow ochre, carmine, Prussian blue, neutral tint, sepia.

1 Colour slab.
6 Field books (when ready).
6 Lecture and surveying note books.
A small supply of stationery including pens.

The cost of these is expected to come to about Rs. 50 which will be adjusted out of the allowance for the purpose given to each Student.

2. The Storekeeper, Babu Birbal, Forest Ranger, is prohibited from issuing any articles from store to any body except,—

(1) On payment in full;
(2) On written order of the Director.

Students requiring articles from store must therefore either pay for them in Cash or obtain from the Director an order on the Storekeeper.

3. The following articles will be supplied by the School on loan, on the students' receipt, at such times as they may be required and will be returned to store when no longer required.

For Survey work.
- Drawing Board.
- Prismatic Compass and stand.
- Planetable and stand.
- Chain and arrows.
- Level and staff.
- Flags.
- Offset rods.
- Pentagraph.
- Planimeter and any others that may be required.

For Forest and other work.
- Diameter guages.
- Tree-measurers.
- 1 pair plant collecting boards with sufficient paper (will usually be retained during whole term of studies).

4. Books of reference may be consulted in the Library or Herbarium, but will not be permitted on any account to be removed from those rooms. The following books will be lent when required:—

Forest Department Codes.
Forest Acts and other Acts required for the law Course.

5. All articles lent to students must be signed for previous to issue, and the student will be responsible for loss or damage to them, the amount payable for

such loss, or damage to be assessed by the Director or some School Officer authorized by him.

6. The apparatus, specimens, Maps &c., used in lecture or placed in the Museum are the property of the Government and must on no account be removed from the School premises. Any infraction of this order will be most severely punished.

ENTRANCE EXAMINATION, 1891.

I.—English.

(Time allowed 3 hours).

A.—COMPOSITION.

I.—Put into plain simple prose the following:—

(1) Who can despair of Governments that passes a Soldier's Guardhouse, or meets a redcoated man in the streets! That a body of men could be got together to kill other men when you bade them: this, *a priori*, does it not seem one of the impossiblest things?

(2) Like a huge Python, winding round and round
The rugged trunk, indented deep with scars
Up to its very summit near the stars,
A creeper climbs, in whose embraces bound
No other tree could live. But gallantly
The giant wears the scarf, and flowers are hung
In crimson cluster all the boughs among
Whereon all day are gathered bird and bee.

II.—Put into the *indirect* form the following:—

I was passing through the forest, and perceived in the distance a cloud of smoke rising like a column from above the trees. It did not take me long to reach the nearest village, summon a party of a dozen labourers and repair to the scene of the disaster. As is usual in such cases, it was much further off than I had expected. Partly by a liberal use of sand and dry earth, partly with rude brooms quickly improvised from the green branches of such trees as still possessed their leaves, I and my band of willing assistants speedily put an end to the blaze.

III.—Put into the *direct* form

Professor Blackie said he had only one other remark to make regarding the method of teaching languages. It was this. He advised that all languages, whether dead or living, should be taught by a living appeal to the ear and a living response from the tongue of the learner. He thought, as indeed also he knew from experience, that a more living familiarity with foreign tongues would then be acquired in three months than by the formal method of grammar rules in as many years.

IV.—Write a short essay on one of the following subjects—

(1) The advantages of railways.

(2) An account of the method of cultivation and harvesting in India of any of the following crops, (*a*) rice, (*b*) indigo, (*c*) sugarcane.

(3) A description of any large town with which you are acquainted, its situation, natural features, chief buildings, the occupations of its inhabitants and the historical events which may have taken place in it.

B.—CONVERSATION.

The candidate must, in a conversation, extending over at least a quarter of an hour, satisfy the officer conducting the examination that he possesses a fluent and accurate colloquial knowledge of English. In order further to test his ability to understand spoken English, he will be required to write in his own words, in his vernacular (Hindustani, Bengali, Tamil, English, &c., as the case may be) the substance of a communication made to him verbally in English, such as an order to a Forest Subordinate. (A certificate to the effect that the candidate has satisfied both these tests must accompany his written answer to the previous questions.)

II.—Arithmetic.

(*Time allowed* 2½ *hours*).

I.—Add together

Rs.	a.	p.		
7,25,697	0	10	and	2569·473
1,12,989	15	1		1077·985
2,17,854	8	7		9567·539
9,76,547	11	5		7308·672
3,39,576	13	6		8754·566
5,19,258	6	4		6991·479
7,88,077	9	11		

II.—Multiply 157·009 by 7·67 and $1\frac{1}{4}\frac{3}{4}$ by $5\frac{1}{4}$.
Divide 62978·17 by 579·63 to 4 places of decimals.

III.—If I buy timber at the rate of Rs. 1-5-9 per cubic foot, how many cubic feet shall I get for Rs. 500?

IV.—A stock broker invests Rs. 5,000 in 4 per cent. Government paper which is then quoted at $97\frac{1}{16}$. What will be his capital holding, neglecting brokerage?

V.—An elephant gets 13 seers of rice daily, the price of rice is Rs. 2-6-0 per maund of 80 seers. What is the cost of the animal's feed for a month of 30 days.

VI.—Find the square root of 558·009 and the cube root of 73,560,059.

VII.—Simplify $1 + \frac{1}{6+\frac{1}{4}}$ of $\frac{41\frac{1}{11}}{9\frac{5}{17}}$ of Rs. 319-11-11.

VIII.—Find the G. C. M. of 2720, 5168, and 357; and the L. C. M. of 12, 21, and 57.

III.—Algebra.

(*Time allowed* 2½ *hours.*)

I.—Multiply $x^3 - x + 1$, $x^2 + x + 1$, and $x^4 - x^2 + 1$.

II.—Simplify $\dfrac{a^2\left(\frac{1}{b}-\frac{1}{c}\right) + b^2\left(\frac{1}{c}-\frac{1}{a}\right) + c^2\left(\frac{1}{a}-\frac{1}{b}\right)}{a\left(\frac{1}{b}-\frac{1}{c}\right) + b\left(\frac{1}{c}-\frac{1}{a}\right) + c\left(\frac{1}{a}-\frac{1}{b}\right)}$

III.—Divide $a^4 + a^3b - 8a^2b^2 + 19ab^3 - 15b^4$ by $a^2 + 3ab - 5b^2$.

IV.—Extract the square root of
$x^6 - 6a\,x^5 + 15a^2\,x^4 - 20a^3\,x^3 + 15a^4\,x^2 - 6a^5\,x + a^6$.

V.—If $a = 2$, $b = 3$, $c = 6$ and $d = 5$ find the value of
$\sqrt[3]{(a+c-b)^2d} + \sqrt[3]{(b+d)(5d-4c)} + \sqrt[3]{(c-a\,d-b)}$

VI.—Solve the following equations:—

(1) $x = \cfrac{3}{4 - \cfrac{3}{4 - \cfrac{3}{4 - x}}}$

(2) $\dfrac{x+3}{x-3} - \dfrac{y-3}{y+3} = 2$; $\dfrac{x-3}{2x+3} + \dfrac{y-3}{2y+3} = 1$

(3) $\dfrac{4}{x-6} - \dfrac{x-2}{x-3} = \dfrac{x+4}{x-5} - \dfrac{2(x-1)}{x-4}$

VII.—A bag contains eight anna pieces, two anna pieces and rupees. There are eight times as many two anna pieces as there are rupees, while the number of two anna pieces is a half that of the number of eight anna pieces. The total value of the money in the bag is Rs. 10. Find the number of each kind of coin in the bag.

VIII.—Show that $\dfrac{a^{\frac{1}{2}}\,b^{\frac{1}{3}}\,c^{\frac{1}{3}}}{\sqrt[3]{a^3\,bc}} \times \dfrac{a^2\sqrt{bc^{\frac{1}{2}}}}{\sqrt[4]{a^2\,b^{\frac{1}{2}}c}} = \sqrt{b}$

IV.—Geometry.

(*Time allowed* 2½ *hours.*)

I.—Define:—A point, a plane rectilineal angle, a circle, parallel straight lines, ratio, similar rectilineal figures.

II.—Draw a straight line at angles to a given straight line from a point within it.

III.—If a side of any triangle be produced, the exterior angle is equal to the interior opposite angles. How many right angles are there in an interior angle of a regular pentagon.

IV.—Triangles upon the same base and between the same parallels are equal.

V.—If any point P be joined to A B C D, the angular points of a rectangle, the squares on P A and P C are together equal to the squares on P B and P D.

VI.—In an obtuse angled triangle the square on the side subtending an acute angle is less than the squares on the sides containing that angle by twice the rectangle contained by either of these sides and the straight line intercepted between the perpendicular let fall from the opposite angle and the acute angle.

VII.—The angles in the same segment of a circle are equal to one another.

VIII.—Draw parallel to a given straight line, a straight line to touch a given circle.

IX.—The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right angles.

X.—If a straight line be drawn parallel to one of the sides of a triangle, it should cut the other sides or sides produced proportionately.

V.—Mensuration.

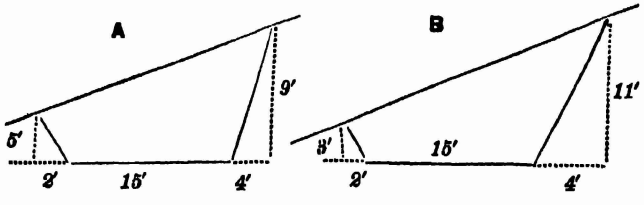
(*Time allowed* 2½ *hours.*)

I.—Find, to 4 decimal places, the side of a square the diagonal of which is 3,267 feet.

II.—A man wishes to know the height of a tall tree. He finds that by walking backwards he can just see the top of the tree over the top of a smaller one which he can measure. The height of the small tree is 17 feet. He is 15 feet from the small tree and that is 35 feet distant from the tall one. What is its height supposing that of his eye to be 5½ feet?

III.—Calculate the cubic contents of a teak log which tapers uniformly from 45 inches in girth at the big to 37 inches at the small end and is 21 feet long. ($\pi = \frac{22}{7}$).

IV.—A and B are cross sections of a road cutting 147 feet apart. Calculate the cost of excavation of the earth between the sections at Rs. 2-8-0 per 1 000 cubic feet.



V.—Estimate the cost of whitewashing the walls and ceiling of a room which is 20 feet long, 17 feet broad and 13 feet high, and which has 3 doors 7 feet by 4 feet, 2 windows 4 feet by 3 feet and a fire place 3 feet by 1½ foot, at the rate of 1 anna 9 pie per 100 square feet?

VI.—A Forest Officer has to plant 150 acres of teak plantation with plants in pits 5 feet apart. How many beds 20 feet by 4 feet will be required to hold the necessary number of seedling planted at 6 inches apart in the beds? What will be the cost of digging pits for the plants 1½ foot cube at Rs 13 per 1,000.

VII.—A common method of calculating the cubic contents of logs is to take the square of quarter mean girth and multiply it by the length.

Show that this gives the purchaser a discount of 25 per cent. on cylindrical measurement if $\pi = 3$.

VIII.—Find the contents of a cone 17 feet high, and having a basal radius of 2 feet 4 inches.

FINAL EXAMINATIONS. MARCH, 1891.

Forestry.

PAPER NO. I. SYLVICULTURE.

1. Define *high forest*, *evergreen*, *root-sucker*, *sapling*, *canopied forest*, *gregarious species*, *regular crop*, *coupe*.

2. Describe fully the action of cover.

3. Describe the requirements in respect of light of a pure regular crop at the successive stages of its development, from the time it appears under its parent and nurse crop to the time when it has in its turn to yield the place to its daughter crop.

4. In a mixed self-sown crop what conditions and characters favour the survival of a species?

5. Account for the gregariousness of any one of the following species:—*Quercus semecarpifolia*, the Himalayan silver fir, *Dendrocalamus strictus*, *Anogeissus latifolia*.

II.

6. Describe briefly how seedlings are raised in nurseries.

7. How do you recognize a good transplant? Why are different sizes of transplants necessary under different conditions?

8. Describe patch sowing.

9. Describe pit-planting.

10. Say what you know regarding drifting sands and the formation of dunes. How are such sands fixed?

11. Compare direct sowing with planting in regard to their applicability under different conditions.

III.

12. Describe the system of jardinage and show that it is applicable in any condition of the forest and of the market.

13. Describe very briefly the uniform method, and state under what circumstances it is applicable.

14. Compare together the regular and jardinage forms of forest; bringing out the respective advantages and disadvantages of each, and mention what intermediate forms have been devised with the object of securing the advantages of both, while getting rid of the disadvantages. To what extent do these intermediate forms fulfil this object?

N.B.—Not more than 10 questions are to be attempted. Full marks cannot be gained unless complete answers are given to 10 questions. At least 2 (of which Question 1 is compulsory) are to be taken from group I, 2 from group II, 2 from group III, and 1 each from groups IV and V.

15. Describe the coppice régime. What are the purposes intended to be served by the standards, when these are left?

16. What are improvement fellings? Why are they of such general application in India and how is their character determined in any case?

17. Give the distribution, habits and requirements of any one of the undermentioned species, and state how forests containing it should be treated.

(1) Teak, (2) Sál, (3) Deodar, (4) *Dendrocalamus strictus.*

IV.

18. State very briefly the principles to be observed in demarcating forests.

19. Describe the object and mode of carrying out ordinary thinnings, (1) in regular forests, (2) in forests marked by jardinage.

V.

20 How are fire-traces cleared? What circumstances fix the width to be given to them?

21. How should grazing in forests be regulated?

PAPER NO. II. THE UTILIZATION, MENSURATION AND ORGANIZATION OF FORESTS.

I.

1. What technical properties have to be considered in reference to wood? What conditions influence the flexibility and elasticity of a wood?

2. Mention the principal defects met with in timber, explaining how they are caused.

3. What kind of wood do we require for railway sleepers? Discuss briefly the relative merits of wooden and iron or steel sleepers.

4. Discuss briefly how wood pulp is made.

5. How should a tree be felled with the axe alone?

6. Describe how to rough square a log.

7. What are the different ways in which forest produce may be sold?

8. How is hay made?

9. What is the difference between cutch and kattha. Describe the mode of manufacture of each.

10. How should pines be tapped for resin?

11. How is the rubber of the *Ficus elastica* obtained?

N.B.—Not more than 10 questions are to be attempted, three at least being answered under group I and at least two from each of the other two groups. To obtain full marks the full number of 10 questions must be answered correctly.

12. Describe very briefly the mode of manufacture of charcoal in ordinary kilns.

II.

13. In surveying by sample plots, what will guide you in determining their size and in selecting them?

14. Describe the actual field work of an enumeration survey.

15. Compare together a complete survey, survey by sample areas and linear surveys.

16. From the data obtained from a sample plot survey how do you determine the volume of the standing stock?

III.

17. Explain the meaning and object of Working Plans. Define *rotation, exploitability, possibility, working circle.*

18. What is a compartment? How is it examined and described?

19. Describe the most common methods of fixing the yield in jardinage.

20. State very briefly what provisions are laid down by the Forest Department Code for guaranteeing the execution of working plans and checking their accuracy.

The Structure and Growth of Plants.

I.

1. Describe cellular tissue, distinguishing briefly between the different kinds.

2. Describe the mode of secondary thickening in the stem of (*a*) *Bauhinia Vahlii* and (*b*) *Millettia auriculata*, and explain in each case what advantage such anomalous mode of thickening is to the climber in question.

3. Describe briefly the structure of the blade of a leaf.

4. Mention the different parts of a complete root-system, giving the mode of origin of each. How does the secondary thickening of a root take place the first time?

II.

5. Describe as fully as you can the influence of temperature on the life processes in plants.

6. Define *turgescence.* Explain how it occurs and why it is a necessary condition of growth.

7. How are roots able to penetrate the soil in every direction? Explain clearly how they absorb nutritive matters from the soil

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N.B.—Students are not to attempt more than eight questions, but at least two must be answered from group I, three from group II, and one from group III. Full marks cannot be gained unless complete answers are given to eight questions.

and how they are able to utilise every portion of the soil within their spread.

8. How do the different constructive materials travel in plants?

9. State briefly what you know of metabolism and ferments, and account: (1) for the dormant period through which all plants that are not annual pass; (2) for a smaller percentage of seeds germinating if sown immediately after they ripen than if kept for some time before sowing.

10. Describe briefly the three stages of growth. Why are bamboos able to bend to any angle even after the internode in which bending takes place is full-grown?

11. Describe the different modes of ascension of climbing plants.

12. What influence does light exercise on (1) the nutrition and (2) the growth of plants?

13. State briefly what you know regarding fertilisation.

III.

14. How do wounds in plants heal up?

15. Explain briefly the mode of propagation and nutrition of parasitic fungi.

16. Why do excessive temperatures hurt plants, especially if the alternations between the extremes of cold and heat are rapid?

Natural Science.

Paper No. I. PHYSICS AND CHEMISTRY.

1. Define specific gravity and describe carefully a method of determining the specific gravity of a solid. A given body A weighs 7·55 grammes in air and 5·17 gr. in water and 6·35 gr. in another liquid B, find the density of A and B.

2. What do you understand by the pressure of gases? Apply the theory of pressure to explain the principle of the barometer and the syphon.

3. Describe carefully the method of construction and graduation of a mercurial thermometer.

How many degrees Reaumur and Centigrade correspond to +430 Fahrenheit?

4. Define reflection and refraction as applied to light. Give the laws of refraction of a luminous ray.

5. Give the properties of Hydrogen, how can it be prepared cheaply on a large scale?

6. What is allotropy, name the three allotropic modifications of carbon and give their chief peculiarities?

7. What reasons have we for supposing that air is a mechanical mixture and not a chemical compound. What is the composition of air and how is it determined?

8. Describe phosphorus, potassium and calcium.

PAPER NO. II. GEOGRAPHY, MINERALOGY AND SOIL.

1. How may sedimentary rocks be classified?
Describe briefly the origin of a shale, a sandstone, and a conglomerate.

2. What is coal? Give a section of a typical coal seam showing the character of beds lying above and below the coal itself.

3. Describe the chief ores of iron which are found commonly in India, stating how they can be distinguished the one from the other.

4. Describe carefully the action of a river with regard to the formation of deposits and denudation of the earth's surface.

5. How may soils be classified as regards their mineral character? How are soils formed?

6. Give the chief physical properties of soils and state how these affect the growth of plants.

7. How are dew and frost caused? What conditions favour the occurrence of frost?

8. What influence do forests exercise on the soil and climate of a place?

Surveying.

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1. It is required to ascertain the relative position of two points P and Q that are inaccessible. A line, A B, 200 yards long, is accurately measured, and the following angles are observed:—

$\angle$ A B Q = 127° $\angle$ B A P = 105°
$\angle$ A B P = 55° $\angle$ B A Q = 37°.

Draw a scale of 90 yards to an inch, and draw a plan to true scale showing the positions of the two points P and Q and write down their distance apart in yards.

2. A length of 1 chain 25 links is represented on a plan by 1·65 inches. Draw a diagonal scale of feet for the plan, showing 300 feet. Show all your calculations, figure your scale properly, and write above it its representative fraction.

Show clearly, by two small marks on the scale, the points you would take in order to measure off a length of 123 feet.

3. In undertaking a Forest Survey what considerations would guide you in adopting a scale for the survey.

4. Explain the method of surveying with a chain only.

5. What is meant by the term "Variation of the magnetic needle," and state how you would ascertain it?

6. State briefly the use of the plane-table and its advantages over other methods of plotting a detailed survey.

7. Construct an acre square for deducing areas from a map on the scale of 4 inches = 1 mile and explain the construction.

8. Explain how the results of Planimeter readings are converted into acres, the scale of the map being 16 inches = 1 mile.

9. How many ways do you know of reducing and enlarging maps and plans; describe one of them.

10. Explain briefly the method of obtaining differences in height by means of the spirit level.

Forest Engineering.

1. Describe the best way of preparing lime.

2. Describe the preparation of good pucka bricks.

3. Give with illustrations the simplest forms of small wooden bridges, explaining the use of the different pieces of wood employed.

4. What is a truss? What is its object and the uses of its component parts? What are wall-plates and why used?

5. It is required to thatch a house, the roof to be pyramidal. The *plan* of the roof is square, each edge measuring 38 feet. The slope is 45°. Estimate the cost of thatching at Rs. 3-8-0 per 100 square feet.

6. What are the kinds of flooring usually employed in Forest houses? Describe how you would set to work to lay down a chunam floor.

7. What are the principal means of land transport? If told to prepare a scheme of transport from a forest to a timber depôt what considerations would guide you in your choice of the system to be used?

8. Write an account of the timber-catching boom at Dakhpathar and describe how it is used and its advantages.

Forest Law.

1. What is property and how is it acquired? Why is it important to distinguish between moveable and immoveable property, and under which category is standing timber included?

2. Give the procedure for acquiring land for public purposes.

3. Prove clearly the general right of Government to all waste lands. Give the name of any law where this is expressly stated.

4. Explain the use of Chapter IV of the Indian Forest Act (on Protected Forests) and the danger of misapplying its provisions.

5. In what manner does a Forest Settlement Officer regulate rights to wood and rights to water under the different Indian Forest Acts.

6. What legal powers are possessed by, or usually granted to, Forest Officers?

7. Give an account of any Rules for the management of forests other than Reserved Forests with which you are acquainted.

8. What is meant by compounding an offence? What are the Sections of the three Forest Acts which refer thereto, and how is the procedure usually regulated?

Forest Accounts and Procedure.

1. Define the terms credit, debit, balance, assets and liabilities.

2. What officers are usually required to keep a Cash Book (Form No. 23) and how should it be kept?

3. Name the authority whose sanction is required to each of the following works in a Forest Division :—

(*a*) Purchase of a tent at a cost of Rs. 550.
(*b*) Do. of an office almirah at Rs. 25.
(*c*) Do. of a piece of land for a Forest chauki at a cost of Rs. 100.
(*d*) Repairs of a Forest road at a cost of Rs. 250.
(*e*) Construction of a sledge road at a cost of Rs. 5,500.
(*f*) Purchase of 20 axes at Re. 1 each.

4. The Jaunsár Forest Division supplies the Rajputana-Malwa State Railway with sleepers and the Railway in its turn supplies iron rails for Forest works. Briefly describe the procedure to be followed in the adjustment of the accounts between the two Departments.

5. Prepare a Cash Book (Form No. 23) in the Form supplied to you, and arrange in it the following items adding Heads of Service, final balance, &c., so as to complete it in all respects :—

[*Here items*].

6. A contractor cuts 100 Deodar trees in Deobar Forest, and converts the same into 400 beams, 600 rafters and 200 planks ; the same is carried to the Chakrata depôt, and 300 beams, 400 rafters and 100 planks are sold therefrom at Rs. 5, 1, and 2/8 respectively to Murlidhar, who pays in Rs. 1,750 leaving a balance of Rs. 200 outstanding. Make the needful entries in the timber statements provided.

7. Define a case and a file, and briefly describe the procedure to be followed in conducting official correspondence, naming registers to be kept up in connection therewith. How is correspondence often simplified in Range offices ?

8. Briefly describe the procedure to be followed in the transfer of charge of a Divisional or Range Forest Office.